

Feasibility Report - Final Environmental Impact Statement/Report
Water Resources Investigation

Saugus River and Tributaries, Lynn, Malden, Revere and
Saugus, Massachusetts

Flood Damage Reduction

Volume 7

Appendix

J - Feasibility Study and EIS/EIR Comments and Responses Section B (Attachments)

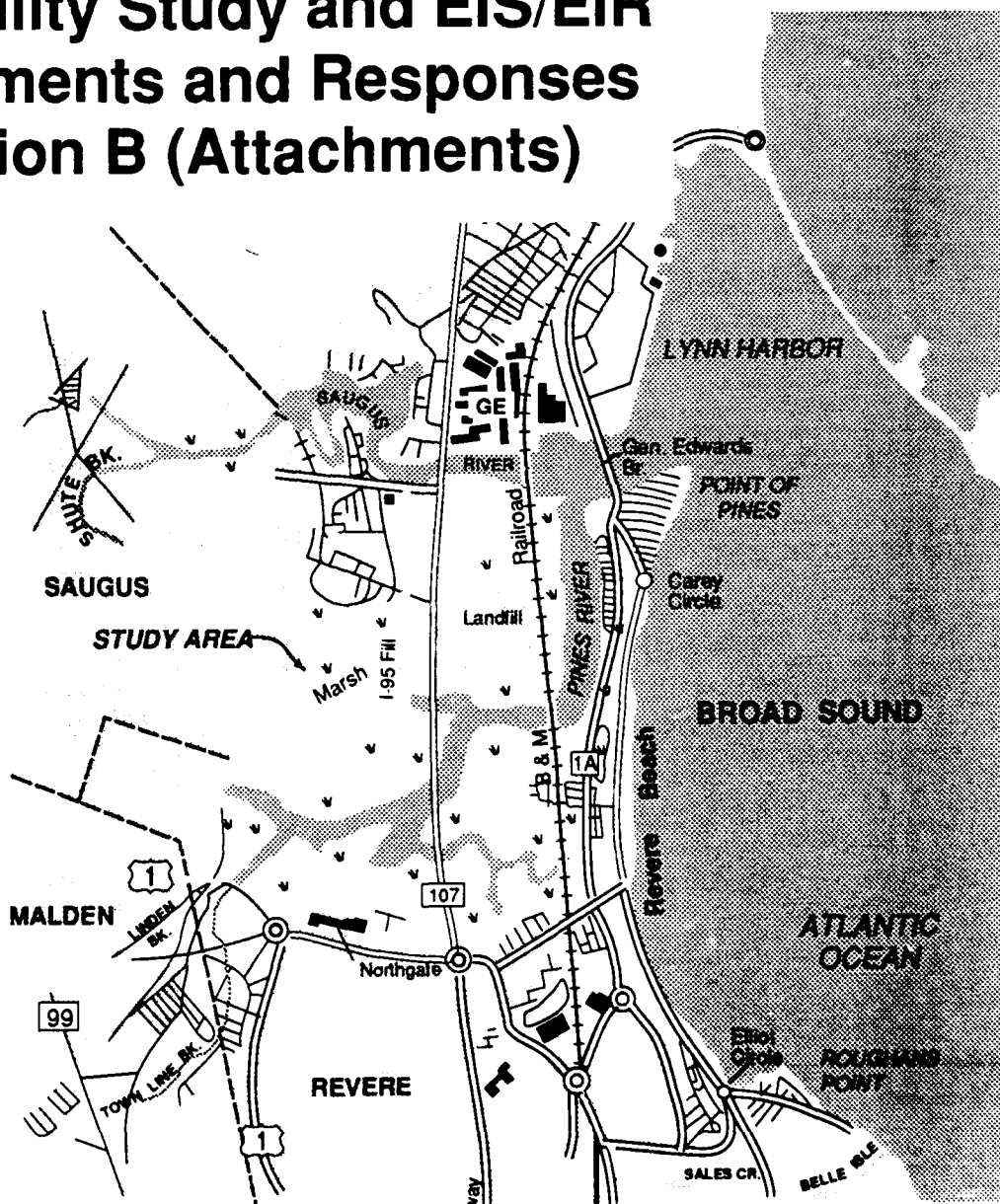
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**LYNN, MALDEN, REVERE
AND SAUGUS, MASSACHUSETTS**

Volume 7
Appendix J - Section B (Attachments)

[illegible]

December 1989

SAUGUS RIVER AND TRIBUTARIES FLOOD DAMAGE REDUCTION STUDY

Lynn, Malden, Revere and Saugus, Massachusetts/Summary of Study Reports:

Main Report and Environmental Impact Statement/Report (EIS/EIR): Summarizes the coastal flooding problems in the study area and alternative solutions; describes the selected plan and implementation responsibilities of the selected plan; and identifies environmental resources in the study area and potential impacts of alternative solutions, as required by the Federal (NEPA) and state (MEPA) environmental processes.

Plan Formulation (Appendix A): Provides detailed information on the coastal flooding problem and the alternatives investigated; includes: sensitivity analyses on floodgate selection (including location and size of gates and sea level rise); optimization of plans; comparison of alternative measures to reduce impacts; and public concerns.

Hydrology and Hydraulics (Appendix B): Includes descriptions of: the tidal hydrology and hydrology of interior runoff in the study area, and of wave runup and seawall overtopping, interior flood stage frequencies, tide levels, flushing, currents, and sea level rise effects without and with the selected project for various gated openings.

Water Quality (Appendix C): Includes descriptions of existing water quality conditions in the estuary and explores potential changes associated with the selected plan.

Design and Costs (Appendix D): Includes detailed descriptions, plans and profiles and design considerations of the selected plan; coastal analysis of the shorefront; detailed project costs; scope and costs of engineering and design; scope and costs of operation and maintenance; and design and construction schedules.

Geotechnical (Appendix E): Describes geotechnical and foundation conditions in the study area and the design of earth embankment structures in the selected plan.

Real Estate (Appendix F): Describes lands and damages, temporary and permanent easements and costs of the selected plan, including the five floodgate alignments studied.

Economics (Appendix G): Describes recurring and average annual damages and benefits in study area floodzones; economic analysis and optimization of alternative plans.

Socioeconomic (Appendix H): Describes the socioeconomic conditions in the study area and the affects of the selected plan on development in the floodplain and estuary.

Planning Correspondence (Appendix I): Includes all letters between community officials, agencies, organizations and the public and the Corps prior to agency and public review of the draft report.

Feasibility Study and EIS/EIR Comments and Responses (Appendix J): Includes all project revisions, and comments and Corps responses to letters received during agency and public review.

Environmental (Appendix K): Includes basic data from investigations of environmental resources in the study area and presents the Mitigation Incremental Analysis.

SAUGUS RIVER AND TRIBUTARIES
FLOOD DAMAGE REDUCTION STUDY

APPENDIX J - Feasibility Study and EIS/EIR Comments and Responses

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ATTACHMENT A

CORPS REPLIES TO
WASHINGTON LEVEL REVIEW TEAM
FINAL ASSESSMENT

1 Nov. 1989

**Saugus River and Tributaries, MA-NED Reply to Washington Level Review Team
Final Assessment**

1. General. The WLRC Team Final Assessment of subject report was received on 8 Sep 89 and was preceded by a draft assessment on 15 Aug 89. The following replies to the final assessment were discussed with the WLRC team following a site visit on 17 and 18 Sep 89 and meetings on 19 and 20 Sep 89 with NED staff (see attached attendees). On several issues WLRC team requested additional information to review development of the damage analysis information and State wetland regulations. In addition, they will be requesting Hydraulics and Hydrology at Headquarters to prepare a position on the effectiveness of the project's operating procedures. Office of Counsel will review the effectiveness of State wetland laws to assure adequate protection of the estuary storage area.

The WLRC team recommended emphasis on a quality product and receipt of a letter indicating preliminary CZM Consistency and Water Quality Certification rather than attempting to push for a December BERH meeting. The BERH meeting has been delayed until March.

2. PLAN FORMULATION

2a. Revere zones 1, 2A, 2B, and 3 will be evaluated as separate elements for the Regional Plan and LPP. Also Lynn's LPP will be evaluated to determine whether the last increment of protection in reaches P to R including its Strawberry Brook tidegate are incrementally justified. Lower levels of protection for the Revere Beach Backshore LPP will be investigated to determine the point of greatest net benefits, rather than infer that levels below 100 year would not be considered.

2b. The sensitivity of the Saugus River and Tributaries Project due to the proposed Revere Beach Erosion Control Project will be evaluated by determining the total loss or up to a 20 year frequency loss in benefits due to reduced overtopping by the new beach.

2c. The Town Line and Linden Brook flood control project is expected to be built in five to ten years by the MDC (Reference Main Report page 29) and final design has not started. When construction starts, it is expected to be accomplished in phases. With design of the Regional Plan proceeding concurrently, the design of the MDC project would be modified to exclude costs unnecessary with the Regional Plan.

3. PROJECT COSTS

3a. The recreation benefits result from the features recommended in the plan and are independent of the additional features which the MDC would construct. The additional MDC features including, for example, landscaping, irrigation, a new bath house, restored pavilions, board walks and lighting which would extend the use of the park, would realize benefits over and above benefits claimed in the report.

Only the cost of a flood control dike located on higher ground adjacent to the Boulevard would be eligible for 65/35 cost sharing. All other costs of the Park Dike required for separable recreation use would be cost shared 50/50. This will be reflected in the cost sharing.

3b. The \$38,800 OMRR costs for project features were developed in detail and presented in the Design Appendix. The future shorefront OMRR costs around the estuary, with and without the project are costs incurred by property owners. Generally, due to a lower level of design on these structures, the useful life is shorter than Corps built projects and thus have a higher OMRR cost. An explanation of the analysis and criteria can be found in Appendix A (pg. A-47 and Addendum 2).

3c. The value of wetlands is based on market value estimates which are found along most of the Massachusetts coast. These wetlands have value for limited agricultural use (harvesting of marsh grass). The use of the wetlands for storage of flood waters would not change the existing use due to restrictions currently imposed (or to be imposed, i.e. the Wetland Restriction Program) by the ACEC designation on these coastal wetlands. The levels and frequency of flooding on these wetlands would normally not be changed by the project except during coastal storms when flood levels would be reduced as a result of the project.

State wetlands and ACEC regulations and laws were provided to the WLRC for requesting Office of Counsel and Real Estate to review. These offices should coordinate with NED's Real Estate Office to substantiate that these controls over wetlands will adequately protect the estuary storage area, and that no other real estate interest should be required.

3d. The use of sand bag closures may not be appropriate for conditions involving an infrequent closure used on very rare occasions and possibly on short notice. A temporary closure, such as a dike would likely be more appropriate and be constructed in a shorter time frame. The report would be revised to reflect this change, in addition to investigating a more permanent closure in design.

3e. The report will comply with regulations in preparing the summary of the estimated project cost and PED effort for the main report.

4. DAMAGES AND BENEFITS

4a. As concluded at the meeting on 19 & 20 Sep 89, the 50% of benefits in the freeboard range does not apply to this coastal project. The benefits are 100% of the damages prevented through the performance of the project. The benefits should be corrected for the recommended plan and used to compare the sensitivity of the 100% analysis to the 50% analysis used in maximizing net benefits.

4b. Information about the method of derivation of stage frequencies for sea level rise conditions was provided. Reference Appendix B section 14 "Rising Sea Level" paragraph e "Effects of Future Sea Level Rise on Tidal Flood Plain Zones" Appendix B pages 122-126. Inundation reduction benefits attributable to the project because of sea level rise were calculated as an additional benefit to the project compared to assuming sea level will not rise. Sea level rise benefits were calculated for a 500 year level of protection only, given limited study time and resources. The sea level rise benefits for the 100 year level of protection and the SPN level of protection were estimated based on the results of the benefit calculation for the 500 year level of protection. The flood damage reduction relationships assuming no sea level rise between existing conditions, the 100 year plan, 500 year plan, and SPN plan, were used to estimate the additional benefits for the 100 year and SPN plans with sea level rise, based on the calculated 500 year benefits.

NED provided the back-up data for the sea level rise benefit calculations to the Washington Level Review Team by memo dated 28 Sep 89 (Ignazio/Schiffer).

4c. Future development planned for the project area includes the Lynn South Harbor Development, to consist of seven high rise office buildings, 500 residential units, and 350 room hotel, 15 retail shops, a 500 seat restaurant, a 200 slip marina, a harbor club facility, and parking for 2500 cars. This development was estimated in 1985 to cost \$500 million. Another development planned for the project area is the Harborside Landing Condominium project, which is to contain 452 condominium units, a public marina, and parking on ten acres of land, for an estimated cost of \$100 million. An office and retail development planned to be built at the Revere Beach MBTA Station is valued at \$9 million, and a \$50 to \$60 million residential development by Carabetta Residential is planned for the adjacent land. Together, these major developments planned for the project area have a value of over \$660 million. Since current regulations require all new structures built in a flood plain to be floodproofed to the 100 year event, these structures will not be damaged in the more frequent, below 100 year, events. However, should a greater than 100 year event occur and the floodproofing elevations of the new structures are exceeded, it is reasonable that such an event could cause \$15 million in damages. \$15 million is only 2% of the total \$660 million value of the structures. NED provided the supporting back-up data for future developments included in the flood damage analysis to the Washington Level Review Team by memo dated 28 Sep 89 (Ignazio/Schiffers).

4d. Transportation benefits were included in the analysis of the cost of flooding to Lynn, Revere and Saugus. Average ridership per day for the MBTA Blue Line through Revere and the B&M Commuter Rail were determined, and the costs of lost service due to flooding, the cost of providing busing to route riders around the flooding, and the costs of actual physical damage to structures and utilities of the rail service were included in the benefit analysis. Flooding damages to highways were also included in the analysis, including the costs of road repairs, costs of traffic diversions, clean-up costs, and losses of autos. These damages were calculated for Route 1, Route 1A, Route 107, Broadway Street, and the American Legion Highway.

4e. Flooding damages to vehicles were included in the analysis as part of the total damages to residential structures. Vehicle damages were included in the typical damage functions developed for the various types of residential structures. It was assumed that each house had two vehicles valued at \$2000 each. At flooding three feet above the first floor elevation of the structure, the vehicles at that structure were considered to receive full damage, or \$2000 of damage. As the flood stage increases from the first floor elevation to two feet above the first floor, vehicles receive minor damages, increasing from \$50 to \$500 per vehicle. With flooding at the first floor elevation, damage to vehicles is 1 to 4 percent of the total structure damage, depending on the type of structure. With flooding at one foot above the first floor elevation, damage to vehicles is two to three percent of the total damage. At two feet above first floor, vehicle damage is also two to three percent of the total damage, depending on the structure. At three feet above the first floor, vehicle damage is seven to 11 percent of the total damage. This jump from two to three percent to seven and 11 percent reflects the increase in damage to the vehicle from minor damage under \$500 to full damage of \$2000, and also reflects that a house receives the major portion of damages with first floor flooding. Damage to vehicles in commercial car lots was also included in the analysis. It was assumed that car lot owners would be able to move and thus prevent damage to one-half of their vehicle inventory. Damages were then estimated for each car lot based on the size of the lot and the types of vehicles sold.

NED provided the back-up data showing the methodology by which damage to vehicles was included in the flood damage analysis to the Washington Level Review Team by memo dated 28 Sep 89 (Ignazio/Schiffers).

4f. Discussions of the damages and derivation of the elevation-frequency relationships in Table 17 in Appendix B were provided at the 17-20 Sep 89 meeting and site visits. Reference Appendix B Section 7 "Tidal Flood Plain Zones" pages B-43 through B-54 for discussion of existing condition elevation frequency relationships. Modified elevation frequency discussion is presented in Appendix B Section 9 "Interior Runoff During Storm Tides" pages B-60 through B-62. Back-up data for damages and recurring losses were provided to the WLRC by memo dated 28 Sep 89 (Ignazio/Schiffers). The cause of damages are discussed in the main report pages 17-20; Appendix A, pages A-17 to A-34 and Appendix B, pages B-46 to B-54.

5. SEA LEVEL RISE

The project will be evaluated for a 50 year evaluation period and potential modifications for Case II and III sea level rise.

6. ESTUARY STORAGE

6a. The SPN plan assumed a coincident 100 year interior runoff with the required storage capacity of 5,800 acre-feet. Questions have been raised by the WLRC concerning the stated requirement of 5800 acre feet of interior storage for the SPN design level and the recommended interior storage of 5400 acre feet.

As discussed in Section 12 "Design Floods" page B-105 of Appendix B - the establishing of interior drainage requirements and criteria for a regional flood control project is not a definitive hydrologic process. In attempting to provide a high degree of flood protection in a regional plan, severe interior runoff criteria was adopted.

With Design Tide frequencies of one percent (100 year), 0.2 percent (500 year) and SPN, the adopted coincident interior runoff rates were ten percent (10 year) two percent (50 year) and one percent (100 year) chance events respectively. In all cases future improved drainage conditions were assumed, and resulting peak interior runoff rates were assumed to occur continuously throughout the closure period. The interior runoff volumes together with uncontrolled wave overtopping for the three design conditions were 2300, 4400 and 5800 acre feet respectively.

Sufficient estuary lands are presently available to adequately store interior runoff. Preserving all lands below +7 feet NGVD would assure 5400 acre feet of storage between elevation +2 and +8 feet NGVD (start of damage). Therefore, 5400 acre feet was adopted as an interior storage requirement to assure that sufficient storage is available to allow for development of implementable operational criteria for the Regional Plan. The 5400 acre feet is 93 percent of the required storage assuming a SPN ocean tide coincident with a peak one percent chance interior runoff. Based on the assumptions described above i.e. 1) future improved drainage condition interior runoff 2) peak interior runoff rates occurring continuously over entire closure period and 3) the relative severity of adopted coincident frequencies, the adopted 5400 acre feet is considered a reasonably conservative requirement and will be refined by rainfall runoff modelling and mapping of the estuary during design.

6b. The gate closure procedures (navigation gate and tainter gates) will be based on hydrologic conditions affecting the site and predictions of weather and storm surge severity. Gaging equipment will be installed so it can be continually monitored at the floodgate operating room for the following hydrologic parameters:

- Ocean level
- Harbor level
- Upper tidal basin level
- Precipitation
- Barometric pressure
- Temperature
- Wind direction and velocity
- Saugus River Discharge (DA- about 25 sq mi)
- Possibly a GOES Data Collection Platform to relay back this hydrologic data to the Corps Reservoir Control Center or to the MDC office in Boston.

A voice radio and telephone communication with the MDC office in Boston and the Corps RCC office will be implemented. In addition, weather forecasts, severe storm warnings and tidal surge forecasts will be provided by the Boston office of the National Weather Service by teletype or similar means. Also the National Ocean Service will annually provide predicted hourly tide levels and daily high and low tide levels for Broad Sound for every day of the year.

The prescribed regulation procedures, to be developed and prepared by the Corps Reservoir Control Center will be fully coordinated with MDC personnel, US Coast Guard, local officials and navigation interests. The procedures will be based on long-term operating experiences at several Corps built tidal barriers located in southern New England, namely Stamford, CT, Providence, RI and New Bedford-Fairhaven, MA. The Stamford and New Bedford barriers, in operation since 1968 and 1966, respectively utilize harbor ponding areas for interior runoff and are operated with due consideration to navigation interests. Necessary training of MDC personnel will be provided by RCC personnel during and after construction of the project.

It is of interest to note that the New Bedford-Fairhaven harbor ranked in value as the number 2 fishing port in the country in 1988. In 1987 commerce equalled 453,000 tons which included 245,000 tons of fuel oil, 90,000 tons of fish/shellfish, 79,800 tons of sand/gravel/rock and 23,000 tons of fresh fruits. In addition, thousands of passengers were transported on sight-seeing tours. The operation of the New Bedford barrier, which has been operated 140 times since its completion for hurricanes and coastal storms, has had no adverse impacts on these activities.

In February 1978 the National Weather Service provided weather and storm bulletins to the public concerning the possibility of severe weather, strong winds and high tides some 36 to 48 hours in advance of the onslaught of the storm. There will be more than enough lead time provided by the National Weather Service to coordinate all necessary activities before gate closures are undertaken which will take approximately 20-30 minutes to complete. The regulation procedures for major storm and tide conditions, as well as the more frequent lesser events will take into account during the period of closure the following:

1. the volume of runoff from the Saugus River (25 sq. mi \pm),
2. the potential runoff from the local 21 sq. mi. area, based on existing rainfall at the site, plus additional forecast rainfall (a rainfall-runoff model for the local area will be developed during the design phase),
3. and potential wave overtopping.

Under rare design storm conditions, gate closures would be complete when rising tide levels reach elevation 2.0 ft. NGVD. Table 14, page B-32 of Appendix B, which was based on information prepared by the National Weather Service, indicates in the 57 year period from 1922-1979 that the maximum tidal surge between each hourly observed tide level and each hourly astronomical (predicted) level was 4.9 feet. During the February 1978 event the maximum tidal surge was 4.6 feet. A plot of the observed and astronomical tides in Boston Harbor on 6 & 7 February 1978 is shown on Figure 19, page B-112 of Appendix B. The highest observed low tide level during this record event (in which two tides reached or exceeded 10 feet NGVD), was minus 2 feet NGVD or four feet below the plus 2 feet used for our design criteria.

6c. The response is being prepared.

6d. Actual loss of storage would not be significant in the estuary due to existing wetland laws in force or to be initiated in the estuary in the future, as well as local assurances required by the project. Laws currently in force include the State's Wetland Protection Act, and ACEC designation. The Wetland Restriction Program is expected in the near future. The Corps Regulatory Program has also been active in protecting the wetland in the study area against illegal fill activities. The project's assurances require protection of the storage area and compensatory storage for any legal fills. Project O&M includes an increased enforcement effort to monitor and enforce the laws, as well as, educate and coordinate with the public, conservation commissions and agencies. Thus, no significant loss of storage should occur with the project.

Provided to the WLRC team at the meeting were a description of the ACEC and Wetland Restriction Program requirement. Also provided were letters of intent to enforce wetland regulations from MDC, Revere, Lynn and Saugus who surround the estuary. Additional coordination on this issue is on-going between the Real Estate office at Headquarters and NED.

The value of the wetlands at \$1500 per acre is based on the upper limit of value for wetlands within the project area. Potential developable areas are not included or considered as part of the wetland area. The non-Federal sponsor realizes the pressures on development around the estuary and supports the need for additional enforcement effort required by the project. The implementation of the State's Wetland Restriction Program will provide additional assistance to the State in protecting the storage area.

7. NON-FEDERAL ASSURANCES

7a. The final feasibility report will include the letter of intent with the statement of financial capability (provided at the 19-20 Sep meeting) and a preliminary financing plan. Letters of assurance from Revere, Lynn and Saugus were also provided.

7b. The response is being prepared.

7c. The non-Federal implementation responsibilities will be worded the same in both the LCA and main report.

8. Final CZM consistency determination and State Water Quality Certification will be obtained following the completion of the General Design Memorandum information. A letter from the State is being requested prior to the Senior Briefing of WLRC decision makers (early February) for an indication of CZM Consistency and Water Quality Certification. The SHPO letter will be provided upon receipt.

9. The statement that the floodgate could be used as a fishing pier was removed from the report.

10. Information provided to the WLRC team at or following the meeting, includes:

- . one full size set of project plans;
- . ACEC and Wetland Restriction Program descriptions;
- . Letter of Intent with statement of financial capability from the Metropolitan District Commission; and letters of assurance from Revere, Lynn and Saugus;
- . and, economic backup sent by letter dated 28 Sep 89.

WLRC MEETING - 19 SEPTEMBER 1989

ATTENDANCE

Bob Hunt	Study Manager, NED
Pete Jackson	Chief, Comprehensive River Basin Sec., NED
Bill Hubbard	Environmental Resource Sec., -NED
Ed Fallon	Real Estate-NED
Paul Pronovost	Planning Division-NED
Alex Otto	CECW-PE
Ed O'Leary	Economics Section, NED
Joe Finegan	Engineering Div.; Chief, Water Control Br.-NED
Mark Geib	Engineering Div. Hydrology-NED
Larry Donovan	Review Manager, WLRC
Edmond A. Schiffers	Economic Reviewer, WLRC
Art Klingerman	Chief, Mgmt. & Review Div. II, WLRC
Forester Einarson	Environmental Review, WLRC
Chuck Wener	Chief, Hydraulics & WQ Sec, NED
Bob Martin	Planning Division-NED
Rich Ring	Economics Section-NED
Karen Frederickson	Economics Section-NED
Steve Rubin	Impact Analysis Branch-NED
Don Wood	Hydraulics WQ Sec-NED
Mike Walsh	Coastal Eng. Sec-NED
Don Martin	CENED-PL-B
Chuck Sargent	BERH (17 & 18 Sep. Site Visit Only)

22 Nov. 1989

SAUGUS RIVER AND TRIBUTARIES, MA-NED FOLLOW-UP REPLY TO WASHINGTON LEVEL
REVIEW TEAM FINAL ASSESSMENT

1. GENERAL. In response to CECW-PE, 1 Nov 89 letter regarding the adequacy of the MDC's letter of intent, two additional letters were provided to WLRC. A letter from the MDC dated 27 Oct 89, clarified their intent to fund the project. A letter of support and assurances from the city of Malden dated 24 Oct 89 was also provided. With regard to your 8 Nov 89 letter recommending acquisition of the estuary storage area, the report is being revised to reflect necessary acquisition costs.

2. PLAN FORMULATION

a.(1) Revere's zones 1, 2A, 2B and 3 were evaluated as separate elements for the Regional Plan and LPP. The Park Dike (and sluice gate) separately protect these areas, and net benefits were optimized at the SPN level, as shown, for zones 2A, 2B and 3. Zone 1 was separately optimized at the 100 year level in the draft report, and benefits held constant in this analysis. The incremental analysis for the rest of the LPP is shown in Item a.(3).

PARK DIKE PROTECTING ZONES 1, 2A, 2B & 3
(Option 1 - LPP and Option 3 - Regional Plan)

	Level of Protection (1988 Price Level)			
	<u>100 Year</u>	<u>500 Year</u>	<u>SPN</u>	<u>SPN+1</u>
First Cost (\$M)*	2.58	2.59	2.73	2.87
Average Annual Cost (\$K)	246	271	283	296
Average Annual Benefits (\$K)	765	828	853	855
Net Benefits (\$K)	519	557	<u>570</u>	559

Note: The First Cost excludes the Recreation increment of \$1.2 M. Annual costs and benefits also exclude the recreation increment.

a.(2) Lynn's LPP was evaluated to determine whether the last increment of protection in reaches P to R including its Strawberry Brook tidegate are incrementally justified. Two additional alternate alignments to tie the project to high ground were evaluated: one alignment was east and another west of C.L. Hathaway and Strawberry Brook. Both alignments first costs were higher and benefits less than the alignments reported in the report. Thus there is no change in the LYNN LPP NED Plan.

a.(3) A lower level of protection for the Revere Beach Backshore LPP was investigated to determine the point of greatest net benefits. The following shows that the remaining North Beach and Pines River increment of the LPP are optimized at the 100-year level. The optimization of Zone 1 to 3 is shown in Item a.(1).

SAUGUS RIVER AND TRIBUTARIES, MA-NED FOLLOW-UP REPLY TO WASHINGTON LEVEL
REVIEW TEAM FINAL ASSESSMENT

	Option 1 (LPP) North Beach & Pines River (Zones 4A to 5C)			
	Level of Protection ('88 P.L.)			
	50 Year	100 Year	500 Year	SPN
First Cost (\$M)	\$14.2	\$14.5	\$15.5	\$18.0
Average Annual Cost (\$K)	1260	1287	1376	1598
Average Annual Benefits (\$K)	1242	1320	1401	1422
Net Benefits (\$K)	- 18	33	25	-176

b. The sensitivity of the proposed Revere Beach Erosion Control Project was evaluated by determining the loss of benefits assuming the new beach would be effective in reducing overtopping up to a 20 year event. Both the LPP Park Dike and Regional Plan remain feasible. The LPP's North Beach and Pines River may not remain feasible.

1988 Price Level	Option 1 & 3 SPN Park Dike Area Zones 1, 2A, 2B, 3	Option 1 - 100 Year No. Beach & Pines River Zones 4A to 5C
Net Benefits (\$K)	\$ 570	\$ 33
Loss of Benefits (\$K)	-295	-249
Sensitivity Net Benefits (\$K)	\$ 275	\$ -216

Regional Plan ('88 P.L.)	Regional Plan	Increment Pt. of Pines	Increment Park Dike	Reg. Plan excl. Pt. of Pines & Park Dike
First Cost (\$M)	\$ 85	\$ 8.7	\$ 2.73	\$ 73.6
Average Annual Cost (\$K)	\$ 8,587	\$ 920	\$ 283	\$ 7,384
Average Annual Benefits (\$K)	\$10,956	\$1,900	\$ 853	\$ 8,203
Net Benefits (\$K)	\$ 2,369	\$ 980	\$ 570	\$ 819
Loss of New Beach Benefit at No. Beach and Pines River (Sensitivity) (\$K)	--	--	--	-249
Sensitivity Net Benefits (\$K)	--	--	--	570

4. a. We concur that 50 percent of the benefits in the freeboard range do not apply to this coastal project. The benefits should reflect 100% of the damages prevented through the performance of the project. The following compares the sensitivity of the Regional Plan benefits using the 50% and revised 100% analysis, which shows an insignificant change in benefits.

Regional Plan Analysis:	50%	100%	Change
Average Annual Benefits: ('88 P.L.)	\$10,860K	\$10,956K	+ 0.8%

SAUGUS RIVER AND TRIBUTARIES, MA-NED FOLLOW-UP REPLY TO WASHINGTON LEVEL REVIEW
TEAM FINAL ASSESSMENT

5. The sensitivity of the Regional Plan to future rates of sea level rise was evaluated using two assumptions: 1) Is the Regional Plan economically justified @ a 50 year evaluation period at the historical rate or when one foot would occur for Case 3.; and 2) Can the project be feasibly modified for sea level rise.

a. The Regional Plan is economically feasible when evaluated for both a 50 year evaluation period with a historic sea level rise and a 35 year life, assuming a one foot rise under the Case 3 sea level rise scenerio.

Project Economic Evaluation Period ('88 P.L.)	Historical Rate	Case 3
	<u>50 Years</u>	<u>35 Years</u>
Average Annual Cost (\$K)	\$ 8,700	\$ 9,040
Average Annual Benefits (\$K)	\$10,624	\$11,980
Net Benefits (\$K)	\$ 1,924	\$ 2,940

b. The Regional Plan could be modified for all cases of sea level rise. Modifications could include measures to maintain a high level of protection, and limiting the number of gate closures to range between 3 and 40 per year. Modifications for the level of protection could return the project to an SPN level after each foot of sea level rise has reduced that level to about a 350 year level of protection. Costs were estimated for raising by one foot the floodgate structure and shorefront protective structures along Lynn Harbor, Revere Beach and Point of Pines (and assuming the top opening of the gates would be raised roughly one foot) for each foot of sea level rise. In order to limit the number of closures to about 40 per year where no significant water quality impacts would occur, the start of damage around the estuary would be raised one foot for each foot of sea level rise. The cost reflects raising low areas along the riverbank with walls or dikes, just as would have occurred without the project to keep pace with sea level rise. Assuming these changes were being made today and the project had experienced one foot of sea level rise, the potential feasibility is reflected in the following analyses for each foot of sea level rise.

Benefits and Costs per Foot of Sea Level Rise (\$ Millions)	Maintain Level of Protection Between SPN and 350 yr.		Limit Gate Closures Between 3 to 40 per year		Maintain Level & Limit Gate Closures	
	Case 2	Case 3	Case 2	Case 3	Case 2	Case 3
Raise Ocean Shorefront & Floodgates	\$ 4.8	\$ 4.3	--	--	\$ 4.8	\$ 4.3
Raise Estuary Rivers Banks	--	--	\$13.4	\$10.7	\$13.4	\$10.7
Average Annual Cost	\$ 0.5	\$ 0.4	\$ 1.3	\$ 1.1	\$ 1.8	\$ 1.5
Average Annual Benefits	\$ 1±	\$ 1±	\$ 1.3±	\$ 1.1±	\$ 2.3±	\$ 2.1±

SAUGUS RIVER AND TRIBUTARIES, MA-NED FOLLOW-UP REPLY TO WASHINGTON LEVEL REVIEW
TEAM FINAL ASSESSMENT

Displaying the average costs per foot of sea level rise facilitates the analysis of Benefits. Raising the level of protection appears justified based on the assumption that Benefits for each foot of sea level rise would be at least equal to the \$1.1 million of benefits presented in the report for one foot of sea level rise. Since similar damages would occur over a shorter period than 100 years, the benefits may be much higher.

Constructing or raising walls or dikes around the estuary for each foot of sea level rise was found nearly equal to the savings in operation and maintenance costs, thus the benefits are shown equal to the annual cost of raising.

6 c. This WLRC comment raises several concerns. First, that the implementation of the recommended plan would allow local communities to reduce the area presently subject to floodplain ordinances. Undoubtedly implementation of the project would prompt the local communities to request a FEMA review of the Special Flood Hazard Areas as now defined. The outcome of this review will depend on FEMA's criteria for establishing the Flood Hazard Area and their coordination with NED as discussed in our response to 7(b). The Main Report will be modified to delete references to post project FEMA developed flood hazard elevations and to include a discussion of the process communities would use to involve FEMA in its post project flood hazard review.

The second concern is that if during a major storm event the gates were not closed early enough and were operated at 7 feet NGVD, there would not be sufficient estuary storage available to keep ponding levels in the estuary below start of damage. As more fully discussed in paragraph 6b, the gate closing procedures would be based on storm tide severity, interior runoff, and necessary ponding requirements. The tide levels at which the gates would be closed would range from about 2 feet NGVD during a very rare event, to approximately 7 feet during an event when the tide is expected to reach 8 to 8.5 feet.

The adopted project capability (APC) is described in sections 12 and 13, and graphically presented on plate 7, all of Appendix B. Using the adopted coincident frequencies described in these sections, additional sensitivity analyses were conducted in an attempt to address WLRC concerns. These analyses, summarized below, indicate potential interior flood levels resulting from assumed closure elevations of 4, 5, and 7 feet NGVD.

SAUGUS RIVER AND TRIBUTARIES, MA-NED FOLLOW-UP REPLY TO WASHINGTON LEVEL REVIEW
TEAM FINAL ASSESSMENT

MODIFIED ESTUARY FLOOD ELEVATIONS

<u>Closure Elevation</u> (ft, NGVD)	<u>1% (100-Yr) Storm Tide</u> (El. ft, NGVD)	<u>0.2% (500-Yr) Storm Tide</u> (El. ft, NGVD)	<u>SPN Storm Tide</u> (El. ft, NGVD)
4	7.0	7.9	8.6
5	7.2	8.2	8.8
7	8.2	9.0	9.5
APC*	7.4	7.6	8.0

- * Closure elevations for Adopted Project Capability are about 6', 3.5' and 2' for the 100-year, 500-year, and SPN, respectively (plate 7 of Appendix B).

These sensitivity analyses demonstrated (see following table) that with an assumed gate closure elevation of up to 5 feet NGVD (mean high tide) the resulting modified interior flood level for SPN conditions would only be up to 0.8 foot higher than the adopted project design interior level. The change for a 500-year storm tide condition would amount to a 0.6 foot maximum increase, while the estuary flood level for 100-year conditions would actually be a little lower. NED feels strongly that the adopted project capability can be met and that gate closure at levels higher than adopted for design is highly improbable. The assumption of closure at levels approaching 7 feet NGVD for storms of this severity is deemed to be unreasonable and of the absolute remotest likelihood.

CHANGE IN ESTUARY LEVEL FROM ADOPTED
PROJECT CAPABILITY FOR VARIOUS STORM TIDES

<u>Closure Elevation</u> (ft, NGVD)	<u>1% (100-Yr) Storm Tide</u> (feet)	<u>0.2% (500-Yr) Storm Tide</u> (feet)	<u>SPN Storm Tide</u> (feet)
4	-0.4	+0.3	+0.6
5	-0.2	+0.6	+0.8
7	+0.8	+1.4	+1.5

SAUGUS RIVER AND TRIBUTARIES, MA-NED FOLLOW-UP REPLY TO WASHINGTON LEVEL REVIEW
TEAM FINAL ASSESSMENT

d. In conformance with your recommendations (Letter dated 8 Nov 89) to acquire a real estate interest in the estuary storage area, the report will be revised to include acquisition costs. The present estimate of \$5.3 million is only an indication of what acquisition might be, based on the average cost of wetlands in the greater Boston area. An indepth study was not conducted but a detailed real estate planning report will be accomplished in the design stage (PED).

7. b. Item "g" of the assurances on page 106 will be deleted and the highlighted second paragraph on page 68 in the Main Report will be revised to read:

The local communities would be required, to the extent legally empowered, to implement floodplain management programs to ensure wise use of the floodplains in, as well as adjacent to, the project area. To effectively operate the project and protect the required storage area, the selected plan calls for acquisition of the estuary storage area in fee or easement up to elevation 7 feet NGVD.

The selected plan also calls for any new development around this tidal estuary to comply with established FEMA flood insurance and floodplain management programs. If after completion of the Regional Floodgate Project, FEMA considers revising the base flood level for flood insurance purposes within the protected project area, this study should be done in coordination with the New England Division, Corps of Engineers. This provision will be included in the LCA and is necessary to ensure there will be no adverse impacts on the project's flood control operations and that proper flood levels are identified for zoning purposes. This study should also consider the impacts of sea level rise. (Note: The provision that the FEMA study be coordinated with the Corps is not included in the LCA since it is not a requirement of the non-Federal sponsor, but will remain in the text of the Main Report.)

ATTACHMENT B

ESTUARY ACQUISITION AND ENGINEERING AND DESIGN COSTS SUMMARY

REGIONAL PLAN CONSTRUCTION SCHEDULE, REVISED

COST ESTIMATE FOR REGIONAL PLAN

ESTUARY ACQUISITION & E+D COSTS - SUMMARY

A. Engineering and Design Estimate

Additional work effort to support acquiring the estuary.

Impact Analysis Br.	Wetlands Aerial Photography Interpretation	\$ 5,000
	Ground Truthing and Verification	<u>\$ 5,000</u>
	Subtotal	\$ 10,000
Real Estate	Planning Report for Acquisition of Estuary	<u>\$200,000</u>
	Estuary Total	\$210,000
Appendix D - Initial E+D Estimate		<u>\$6,720,000</u>
Revised Total E&D		<u>\$6,930,000</u>

B. Estuary Acquisition Costs During Construction

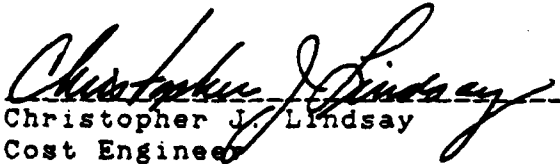
Appendix F (Rev'd) Estuary Real Estate	\$5,326,000
Surveys & Monuments	400,000
Wetland Interpretation	<u>16,000</u>
Total Estuary Acquisition Cost	\$5,742,000
Appendix F (Rev'd) Other Real Estate (Lands & Damages)	<u>\$2,400,000</u>
Revised Total L&D	<u>\$8,142,000</u>

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND

COST ESTIMATE
for
Regional Saugus River Floodgate Plan
under the
Flood Damage Reduction Study
Saugus River and Tributaries
Lynn, Malden, Revere and Saugus
Massachusetts

Prepared By: New England Division

Submitted By:


Christopher J. Lindsay
Cost Engineer

Approved By:


Robert N. Maki
Chief, Cost Engineering Branch

Estimate Prepared Date: April, 1989

Effective Pricing Date: October, 1988

Last Revision Date: 29 November 1989

revised 12/06/89

SAUGUS RIVER AND TRIBUTARIES - CWIS NO. 14021
REGIONAL SAUGUS RIVER FLOODGATE PLAN - ALIGNMENT NO. 2
(October 1988 Price Levels)

STANDARD PROJECT NORTHEASTER (SPN)

SUMMARY OF COSTS BY COST ACCOUNT

COST ACCOUNT NUMBER	COST ACCOUNT	ESTIMATED CONTINGENCY AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
01.	LANDS AND DAMAGES	\$6,989,000	16.5%	\$1,153,200	\$8,142,000
02.	RELOCATIONS	574,400	21.1%	120,900	\$695,000
05.	LOCKS	10,652,200	32.4%	3,453,000	\$14,105,000
06.	FISH AND WILDLIFE FACILITIES	177,000	19.8%	35,100	\$212,000
11.	LEVEES AND FLOODWALLS	40,952,000	22.1%	9,061,300	\$50,013,000
17.	BEACH REPLENISHMENT	164,400	23.1%	38,000	\$202,000
19.	BUILDINGS, GROUNDS AND UTILITIES	237,000	20.0%	47,400	\$284,000
30.	ENGINEERING AND DESIGN	5,775,000	20.0%	1,155,000	\$6,930,000
31.	SUPERVISION AND ADMINISTRATION	3,608,000	25.0%	902,000	\$4,510,000
TOTAL PROJECT FIRST COST		\$69,129,000	23.1%	\$15,965,900	\$85,093,000

NOTE: Estimates for Cost Accounts 01, 30 and 31 are developed elsewhere in this report.

SAUGUS RIVER AND TRIBUTARIES - CWS NO. 14021
REGIONAL SAUGUS RIVER FLOODGATE PLAN - ALIGNMENT NO. 2
(October 1988 Price Levels)

STANDARD PROJECT NORTHEASTER (SPN)

COST ACCOUNT NUMBER	ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT

01.	LANDS AND DAMAGES							
	aquisitions and easements				\$6,991,500	16.5%	\$1,153,600	\$8,145,100

	TOTAL COST ACCOUNT 01. LANDS AND DAMAGES				\$6,991,500	16.5%	\$1,153,600	\$8,145,000
=====								
02.	RELOCATIONS							
	Drainage System for Reach B and C							
	12" RCP	400	LF	20.00	8,000	25.0%	2,000	10,000
	18" RCP	575	LF	25.00	14,375	25.0%	3,594	17,969
	24" RCP	65	LF	30.00	1,950	25.0%	488	2,438
	36" RCP	15	LF	60.00	900	25.0%	225	1,125
	plug 12" pipe	5	EA	500.00	2,500	25.0%	625	3,125
	tie pipes to exist MH	9	EA	500.00	4,500	25.0%	1,125	5,625
	remove exist pipe	100	LF	10.00	1,000	25.0%	250	1,250
	manhole	1	EA	2,000.00	2,000	25.0%	500	2,500
	sluice gate (18"x18")	1	EA	4,400.00	4,400	25.0%	1,100	5,500
	sluice gate (36"x36")	1	EA	13,200.00	13,200	25.0%	3,300	16,500
	sluice gate & closure for 60" pipe	1	LS	38,500.00	38,500	20.0%	7,700	46,200

	Subtotal Drainage System				\$91,325	22.9%	\$20,906	\$112,200

	sluice gate & closure for 60" pipe	1	LS	38,500.00	38,500	20.0%	7,700	46,200
	Lynn Reach F							
	sluice gate (72"x72")	1	EA	24,200.00	24,200	20.0%	4,840	29,040
	sluice gate (84"x84")	1	EA	31,900.00	31,900	20.0%	6,380	38,280
	sluice gate (48"x48")	1	EA	16,500.00	16,500	20.0%	3,300	19,800
	Park Dike South							
	replace conc sidewalk (6")	2,187.00	SY	60.00	131,220	20.0%	26,244	157,464
	Park Dike North							
	replace conc sidewalk (6")	1,576.00	SY	60.00	94,560	20.0%	18,912	113,472
	Sales Cr sluice gate (72"x72")	1.00	EA	24,200.00	24,200	20.0%	4,840	29,040
	Revere Park Dike N/S Floodwalls							
	replace 3" bit conc. pavement	220	SY	16.00	3,520	25.0%	880	4,400
	remove mdc fish pier(if req'd)	5,800.00	SF	9.25	\$53,650	20.0%	\$10,730	\$64,380
	repair road surface	1.00	LS	64,800.00	\$64,800	25.0%	\$16,200	\$81,000

	TOTAL COST ACCOUNT 02. RELOCATIONS				\$574,375	21.1%	\$120,932	\$695,000

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COST

ACCOUNT

NUMBER	ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT

05.	LOCKS							
	mitre gate	1	EA	\$4,124,000.00	\$4,124,000	40.0%	\$1,650,000	\$5,774,000
	piles - auger	12,700	LF	3.00	38,100	30.0%	11,000	49,100
	piles (12 sq. in. prestressed)	12,900	LF	30.00	387,000	30.0%	116,000	503,000
	reinforced concrete	5,890	CY	350.00	2,061,500	20.0%	412,000	2,473,500
	stone blanket	670	CY	40.00	26,800	200.0%	54,000	80,800
	gravel bedding	710	CY	16.00	11,360	100.0%	11,000	22,360
	dredge for cofferdam(-27.5mgvd	23,100	CY	7.80	180,180	75.0%	135,000	315,180
	dredge site (-14) & channel	55,600	CY	7.80	433,680	75.0%	325,000	758,680
	backfill gates & channel	19,100	CY	8.00	152,800	10.0%	15,000	167,800
	cofferdam							
	SSP - PZ-27 (new material)	1,158,300	LB	0.70	810,810	20.0%	162,000	972,810
	piles (pull & stockpile)	1,158,300	LB	0.30	347,490	20.0%	69,000	416,490
	12 in. dia. pipe spud	209,000	LB	0.70	146,300	20.0%	29,000	175,300
	pipe spud (pull & stockpile)	120,000	LB	0.30	36,000	20.0%	7,000	43,000
	box girders	775,000	LB	1.00	775,000	20.0%	155,000	930,000
	gravel	1,300	CY	15.00	19,500	10.0%	2,000	21,500
	site preparation	1	LS	25,000.00	25,000	20.0%	5,000	30,000
	operator - house no. 1	1	LS	165,000.00	165,000	20.0%	33,000	198,000
	operator - house no. 2	1	LS	75,000.00	75,000	20.0%	15,000	90,000
	generator (installed)	1	LS	100,000.00	100,000	20.0%	20,000	120,000
	utilities	1	LS	50,000.00	50,000	20.0%	10,000	60,000
	railing	300	LF	15.00	4,500	20.0%	1,000	5,500
	dewatering	1	LS	504,700.00	504,700	30.0%	151,000	655,700
	dolphins - 4	1	EA	117,430.00	117,430	40.0%	47,000	164,430
	aids to navigation	1	LS	50,000.00	50,000	30.0%	15,000	65,000
	gages and radios	1	LS	10,000.00	10,000	30.0%	3,000	13,000
TOTAL COST ACCOUNT 05. LOCKS					\$10,652,150	32.4%	\$3,453,000	\$14,105,000
=====								
06.	FISH AND WILDLIFE FACILITIES - MITIGATION							
	excavate clean sand							
	used on Park Dike	30,370	CY		see Park Dike estimate			
	excavate salty sand							
	used to build berm/dike	4,000	CY	4	16,000	20.0%	3,000	19,000
	stockpiled on site	35,370	CY	4.00	141,480	20.0%	28,000	169,480
	seed dike	100	MSF	48.00	4,800	25.0%	1,000	5,800
	plant marsh grass (0.5 acre)	1	AC	2,300.00	1,150	25.0%	300	1,450
	fertilizer (0.5 acre)	1	AC	1,200.00	600	25.0%	200	800
	transplant clams	2	AC	6,290.00	12,580	25.0%	3,000	15,580
TOTAL COST ACCOUNT 06. FISH AND WILDLIFE FACILITIES					\$176,610	20.4%	\$36,000	\$212,000
=====								

SAUGUS RIVER SAUGUS RIVER

COST

ACCOUNT

NUMBER	ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
11. LEVEES AND FLOODWALLS								
Flushing Gates								
	tainter gates (15' x 50')	10	EA	\$654,300.00	\$6,543,000	20.0%	1,309,000	\$7,852,000
	reinforced conc. + 25 % labor	7,570	CY	437.50	3,311,875	20.0%	662,000	3,973,875
	concrete + 25 % labor	6,785	CY	312.50	2,120,313	20.0%	424,000	2,544,313
	piles (12' sq. prestressed)	71,012	LF	60.00	4,260,720	30.0%	1,278,000	5,538,720
	stop log	1	LS	547,000.00	547,000	20.0%	109,000	656,000
	site preparation	1	LS	40,000.00	40,000	20.0%	8,000	48,000
braced cofferdam								
	PZ-27 (new materials)	1,498,000	LB	0.70	1,048,600	20.0%	210,000	1,258,600
	PZ-27 (pull & stockpile)	1,498,000	LB	0.30	449,400	20.0%	90,000	539,400
	PZ-27 (drive and pull)	1,334,250	LB	0.45	600,413	20.0%	120,000	720,413
	HP 12x63 (new materials)	180,000	LB	0.80	144,000	20.0%	29,000	173,000
	HP 12x63 (pull & stockpile)	180,000	LB	0.60	108,000	20.0%	22,000	130,000
	HP 12x63 (drive and pull)	118,000	LB	0.60	70,800	20.0%	14,000	84,800
	struts & whalers (materials)	2,188,000	LB	0.50	1,094,000	15.0%	164,000	1,258,000
	struts & whalers (labor)	2,077,000	LB	0.30	623,100	15.0%	93,000	716,100
	struts & whalers (reused)	2,188,000	LB	0.30	656,400	15.0%	98,000	754,400
	gravel (gates & wall)	4,120	CY	15.00	61,800	10.0%	6,000	67,800
gravity wall - Lynn								
	reinforced conc. + 25% labor	387	CY	437.50	169,313	20.0%	34,000	203,313
	concrete + 25 % labor	1,615	CY	312.50	504,688	20.0%	101,000	605,688
	piles (12 sq. in. prestress)	4,960	LF	60.00	297,600	30.0%	89,000	386,600
	dredging	27,800	CY	7.80	216,840	75.0%	163,000	379,840
	dredge & place at gates	7,700	CY	4.00	30,800	75.0%	23,000	53,800
	stone blanket at gates	2,930	CY	40.00	117,200	10.0%	12,000	129,200
	gravel bedding at gates	2,930	CY	16.00	46,880	10.0%	5,000	51,880
	handrail	1,440	LF	15.00	21,600	20.0%	4,000	25,600
	guard rail	1,440	LF	15.00	21,600	20.0%	4,000	25,600
	dewatering	1	LS	1,309,000.00	1,309,000	30.0%	393,000	1,702,000
Subtotal Flushing Gates					\$24,414,940	22.4%	\$5,464,000	\$29,879,000
11. Gravity Wall, Revere, 140 LF, North Section								
	concrete + 25 % labor	1,300	CY	\$312.50	\$406,250	20.0%	81,250	\$487,500
	reinforced conc. + 25 % labor	380	CY	437.50	166,250	20.0%	33,250	\$199,500
	excavation	490	CY	8.00	3,920	20.0%	784	\$4,704
	piles (12 sq. in. prestressed)	4,900	LF	60.00	294,000	30.0%	88,200	\$382,200
	site preparation	1	LS	10,000.00	10,000	20.0%	2,000	\$12,000
braced cofferdam (prices for labor only - materials re-used from other phases)								
	struts	437,230	LB	0.60	262,338	15.0%	39,351	\$301,689
	lateral struts	123,840	LB	0.60	74,304	15.0%	11,146	\$85,450
	wales	66,720	LB	0.60	40,032	15.0%	6,005	\$46,037
	HP 12 x 63 (drive & pull)	97,020	LB	0.60	58,212	20.0%	11,642	\$69,854
	piles (PZ-27 drive & pull)	438,480	LB	0.45	197,316	20.0%	39,463	\$236,779
	guard rail	300	LF	15.00	4,500	15.0%	675	\$5,175
	dewatering	1	LS	40,350.00	40,350	30.0%	12,105	\$52,455
Subtotal Gravity Wall, Revere, North Section					1,557,472	20.9%	\$325,871	\$1,883,000

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COST

ACCOUNT

NUMBER	ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
11.	Gravity Wall, Revere, Middle 140 LF							
	concrete + 25 % labor	826	CY	\$312.50	\$258,125	20.0%	51,625	\$309,750
	reinforced conc. + 25 % labor	356	CY	437.50	155,750	20.0%	31,150	\$186,900
	excavation	3,120	CY	8.00	24,960	20.0%	4,992	\$29,952
	piles (12 sq. in. prestressed)	5,100	LF	60.00	306,000	30.0%	91,800	\$397,800
	site preparation	1	LS	10,000.00	10,000	20.0%	2,000	\$12,000
	braced cofferdam (prices for labor only - materials re-used form other phases)							
	struts	23,300	LB	0.60	13,980	15.0%	2,097	\$16,077
	lateral struts	31,500	LB	0.60	18,900	15.0%	2,835	\$21,735
	wales	18,760	LB	0.60	11,256	15.0%	1,688	\$12,944
	HP 12 x 63 (drive & pull)	97,020	LB	0.60	58,212	20.0%	11,642	\$69,854
	piles (PZ-27 drive & pull)	438,480	LB	0.45	197,316	20.0%	39,463	\$236,779
	guard rail	280	LF	15.00	4,200	15.0%	630	\$4,830
	dewatering	1	LS	22,400.00	22,400	30.0%	6,720	\$29,120
	Subtotal Gravity Wall, Revere, Middle Section				1,081,099	22.8%	\$246,643	\$1,328,000
11.	Gravity Wall, Revere, South 140 LF							
	concrete + 25 % labor	530	CY	\$312.50	\$165,625	20.0%	33,125	\$198,750
	reinforced conc. + 25 % labor	325	CY	437.50	142,188	20.0%	28,438	\$170,625
	excavation	3,120	CY	8.00	24,960	20.0%	4,992	\$29,952
	piles (12 sq. in. prestressed)	3,547	LF	60.00	212,820	30.0%	63,846	\$276,666
	site preparation	1	LS	10,000.00	10,000	20.0%	2,000	\$12,000
	braced cofferdam (prices for labor only - materials re-used form other phases)							
	struts	21,420	LB	0.60	12,852	15.0%	1,928	\$14,780
	lateral struts	30,600	LB	0.60	18,360	15.0%	2,754	\$21,114
	wales	18,400	LB	0.60	11,040	15.0%	1,656	\$12,696
	HP 12 x 63 (drive & pull)	97,020	LB	0.60	58,212	20.0%	11,642	\$69,854
	piles (PZ-27 drive & pull)	438,480	LB	0.45	197,316	20.0%	39,463	\$236,779
	guard rail	280	LF	15.00	4,200	15.0%	630	\$4,830
	dewatering	1	LS	18,000.00	18,000	30.0%	5,400	\$23,400
	access gate	1	LS	1,500.00	1,500	20.0%	300	\$1,800
	guard rail	130	LF	15.00	1,950	15.0%	293	\$2,243
	3" bit. conc. pavement	100	SY	16.00	1,600	25.0%	400	\$2,000
	compacted random fill	111	CY	8.00	888	10.0%	89	\$977
	stone protection	27	CY	45.00	1,215	10.0%	122	\$1,337
	gravel	18	CY	16.00	288	10.0%	29	\$317
	Subtotal Gravity Wall, Revere, South 140 LF				\$883,014	22.3%	\$197,000	\$1,080,000
11.	Lynn Harbor Dikes and Walls							
	Beach B							
	excavation (dike)	37,717	CY	\$8.00	\$301,736	30.0%	\$91,000	\$392,736
	dumped granular	1,600	CY	10.00	16,000	30.0%	5,000	21,000
	compacted random fill	1,620	CY	8.00	12,960	30.0%	4,000	16,960
	compacted imperv	10,638	CY	12.00	127,656	20.0%	26,000	153,656
	gravel bedding	5,274	CY	16.00	84,384	15.0%	13,000	97,384
	stone protection	13,356	CY	45.00	601,020	15.0%	90,000	691,020
	topsoil seeded	2,394	SY	4.50	10,773	75.0%	8,000	18,773
	remove exist bulkhead	1,800	LF	10.00	18,000	75.0%	14,000	32,000

SAUGUS RIVER
SAUGUS RIVER

COST ACCOUNT NUMBER	ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
	stone bedding	5,472	CY	30.00	164,160	15.0%	25,000	189,160
	Subtotal Reach B				\$1,336,689	20.6%	\$276,000	\$1,613,000

SAUGUS RIVER SAUGUS RIVER

COST

ACCOUNT

NUMBER	ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
11. Reach C								
	excavation (dike)	25,070	CY	\$8.00	\$200,560	30.0%	\$60,168	\$260,728
	dumped granular	1,000	CY	10.00	10,000	20.0%	2,000	12,000
	compacted random fill	1,350	CY	8.00	10,800	15.0%	1,620	12,420
	compacted impervious fill	8,550	CY	12.00	102,600	15.0%	15,390	117,990
	gravel bedding	3,750	CY	16.00	60,000	15.0%	9,000	69,000
	stone protection	5,700	CY	45.00	256,500	15.0%	38,475	294,975
	topsoil seeded	1,895	SY	4.50	8,978	15.0%	1,347	10,324
	remove exist bulkhead	1,500	LF	10.00	15,000	25.0%	3,750	18,750
	Subtotal Reach C				\$664,438	19.8%	\$131,750	\$796,000
11. Reach D (ssp & i-wall)								
	PZ-27 (used mat'l left in pl.)	11,703,895	LB	\$0.30	\$511,169	25.0%	127,792	\$638,961
	PZ-27 (new mat'l ssp wall)	82,965	LB	0.70	\$58,076	25.0%	14,519	\$72,594
	PZ-27 (new mat'l i-wall)	171,720	LB	0.70	\$120,204	25.0%	30,051	\$150,255
	steel plate bolts & nuts	8,100	LB	1.00	8,100	15.0%	1,215	9,315
	PZ-40 (leave in place)	1,085,680	LB	0.70	759,976	20.0%	151,995	911,971
	excavation (incl both walls)	8,720	CY	8.00	69,760	15.0%	10,464	80,224
	random fill (both walls)	8,520	CY	6.00	51,120	15.0%	7,668	58,788
	reinf concrete	420	CY	437.50	183,750	25.0%	45,938	229,688
	Gate (30')	2	EA	82,500.00	165,000	30.0%	49,500	214,500
	Gate (40')	1	EA	190,000.00	190,000	30.0%	57,000	247,000
	5' wide platform	167	SY	30.00	5,010	10.0%	501	5,511
	HP 12x63 (new material)	133,480	LB	0.80	106,784	20.0%	21,357	128,141
	HP 12x63 (reused)	69,550	LB	0.30	20,865	20.0%	4,173	25,038
	W 14x90 wales (reused)	93,150	LB	0.30	27,945	15.0%	4,192	32,137
	Subtotal Reach D				\$2,277,758	23.1%	\$526,364	\$2,804,000
11. Reach E (T-wall, 1100 ft)								
	excavation	3,774	CY	\$8.00	\$30,192	30.0%	9,058	\$39,250
	reinforced concrete	880	CY	350.00	308,000	30.0%	92,400	400,400
	compacted imperv	570	CY	12.00	6,840	15.0%	1,026	7,866
	compacted gravel fill	1,798	CY	16.00	28,768	15.0%	4,315	33,083
	stone protection	1,860	CY	45.00	83,700	15.0%	12,555	96,255
	replace pavement	1,220	SY	20.00	24,400	50.0%	12,200	36,600
	remove existing stone	2,750	CY	50.00	137,500	20.0%	27,500	165,000
	Subtotal Reach E				\$619,400	25.7%	\$159,054	\$778,000

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COST
ACCOUNT
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ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
11. Beach F (T.I and Gravity Walls)							
T-wall (100 LF)							
excavation	860	CY	\$8.00	\$6,880	25.0%	\$1,720	\$8,600
reinforced concrete	425	CY	437.50	185,938	25.0%	46,484	232,422
compacted random fill	580	CY	8.00	4,640	25.0%	1,160	5,800
coffer-dam (used PZ-27)	172,800	LB	0.45	77,760	35.0%	27,216	104,976
dewatering	1	JOB	85,400.00	85,400	30.0%	25,620	111,020
concrete piles	2,200	LF	30.00	66,000	50.0%	33,000	99,000
I-wall (180+50 = 230 LF)							
excavation	385	CY	8.00	3,080	25.0%	770	3,850
random fill	282	CY	8.00	1,892	25.0%	423	2,115
reinforced conc. (cap mat'l)	173	CY	437.50	75,688	30.0%	22,706	98,394
PZ-27 (new mat'l, left)	74,520	LB	0.70	52,164	25.0%	13,041	65,205
conc gravity wall (1150 LF)							
excavation	1,725	CY	8.00	13,800	25.0%	3,450	17,250
compacted random fill	9,775	CY	8.00	78,200	25.0%	19,550	97,750
concrete	863	CY	350.00	302,050	20.0%	60,410	362,460
Subtotal Beach F				\$953,291	26.8%	\$255,551	\$1,209,000
11. Revere Beach Park Dike							
South Dike, 1970 LF							
excavation (dike)	10,126	CY	\$8.00	\$81,008	20.0%	\$16,202	\$97,210
compacted random fill	29,845	CY	8.00	238,760	20.0%	47,752	286,512
compacted impervious fill	15,327	CY	12.00	183,924	15.0%	27,589	211,513
gravel bedding	2,482	CY	16.00	39,712	15.0%	5,957	45,669
stone protection	3,723	CY	45.00	167,535	15.0%	25,130	192,665
topsoil & seed (12")	21,453	SY	10.00	214,530	20.0%	42,906	257,436
topsoil & seed (6")	9,417	SY	6.00	56,502	15.0%	8,475	64,977
random fill	33,392	CY	6.00	200,352	20.0%	40,070	240,422
Subtotal South Dike				\$1,182,000	18.1%	\$214,000	\$1,396,000
11. North Dike, 1420 LF							
excavation (dike)	6,816	CY	\$8.00	\$54,528	20.0%	\$10,906	\$65,434
compacted random fill	16,941	CY	8.00	135,528	20.0%	27,106	162,634
compacted imperv	11,048	CY	12.00	132,576	15.0%	19,886	152,462
gravel bedding	1,732	CY	16.00	27,712	15.0%	4,157	31,869
stone protection	2,599	CY	45.00	116,955	15.0%	17,543	134,498
topsoil & seed (12")	17,186	SY	10.00	171,960	20.0%	34,392	206,352
topsoil & seed (6")	5,992	SY	6.00	35,952	20.0%	7,190	43,142
random fill	23,430	CY	6.00	140,580	20.0%	28,116	168,696
Subtotal North Dike				\$815,791	18.3%	\$149,000	\$965,000

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COST
ACCOUNT

NUMBER	ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
<hr/>								
11.	North Closure							
	excavation (retaining wall)	570	CY	\$8.00	\$4,560	25.0%	\$1,140	\$5,700
	compacted random fill	2,690	CY	8.00	21,520	25.0%	5,380	26,900
	concrete retaining wall	339	CY	400.00	135,600	30.0%	40,680	176,280
	gravel bedding	750	CY	16.00	12,000	25.0%	3,000	15,000
	3" bit concrete	2,747	SY	16.00	43,952	25.0%	10,988	54,940
	guardrail	370	LF	20.00	7,400	20.0%	1,480	8,880
	control traffic	1	LS	10,000.00	10,000	20.0%	2,000	12,000
	sandbags	1,820	EA	5.00	9,100	20.0%	1,820	10,920
	Subtotal North Closure				\$244,132	27.0%	\$66,000	\$311,000
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11.	South Closure							
	excavation (retaining wall)	760	CY	\$8.00	\$6,080	25.0%	\$1,520	\$7,600
	compacted random fill	4,068	CY	8.00	32,544	25.0%	8,136	40,680
	concrete	620	CY	300.00	186,000	25.0%	46,500	232,500
	gravel bedding	750	CY	16.00	12,000	25.0%	3,000	15,000
	3" bit concrete	2,500	SY	16.00	40,000	25.0%	10,000	50,000
	guardrail	440	LF	20.00	8,800	20.0%	1,760	10,560
	control traffic	1	LS	10,000.00	10,000	20.0%	2,000	12,000
	mbta temporary dike closure (O&M cost)							
	Subtotal South Closure				\$295,424	24.7%	\$73,000	\$368,000
<hr/>								
11.	Shammut Street Stop Logs							
	excavation	360	CY	\$8.00	\$2,880	25.0%	\$720	\$3,600
	compacted random fill	200	CY	8.00	1,600	25.0%	400	2,000
	concrete	251	CY	300.00	75,300	25.0%	18,825	94,125
	gravel bedding	20	CY	16.00	320	25.0%	80	400
	center post W10x22 14'	1	EA	600.00	600	20.0%	120	720
	8"x8" white oak logs 12'	32	EA	150.00	4,800	20.0%	960	5,760
	Subtotal Stop Logs				\$85,500	24.6%	\$21,000	\$107,000
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11.	North and South Floodwalls							
	excavation	380	CY	\$8.00	\$3,040	25.0%	\$760	\$3,800
	compacted random fill	170	CY	8.00	1,360	25.0%	340	1,700
	concrete	333	CY	300.00	99,900	25.0%	24,975	124,875
	gravel bedding	90	CY	16.00	1,440	25.0%	360	1,800
	reinforced concrete	65	CY	400.00	26,000	25.0%	6,500	32,500
	SSP PZ-27 (pol.sta.- ret.wall)	36250	LB	0.70	25,375	30.0%	7,613	32,988
	topsoil & seed (6")	60	SY	6.00	360	25.0%	90	450
	Subtotal North and South Floodwalls				\$157,475	25.8%	\$40,638	\$198,000

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COST

ACCOUNT

NUMBER	ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
11.	Reach M Gravity Wall							
	excavation	750	CY	\$8.00	\$6,000	25.0%	\$1,500	\$7,500
	compacted random fill	400	CY	8.00	3,200	25.0%	800	4,000
	gravel bedding	125	CY	16.00	2,000	25.0%	500	2,500
	topsoil & seed (6")	500	SY	6.00	3,000	25.0%	750	3,750
	concrete (gravity wall)	525	CY	300.00	157,500	25.0%	39,375	196,875
	sandbags (Carey Circle & Blvd)	2,000	EA	5.00	10,000	25.0%	2,500	12,500
	Subtotal Reach M Gravity Wall				\$181,700	25.0%	\$45,425	\$227,000
11.	Point of Pines - 100 Year Storm							
	Reach A, Revetment							
	excavation	3,700	CY	\$8.00	\$29,600	20.0%	\$6,000	\$35,600
	gravel bedding	640	CY	16.00	10,240	20.0%	2,000	12,240
	underlayer stone	1,900	CY	35.00	66,500	20.0%	13,000	79,500
	armor stone	3,600	CY	70.00	252,000	20.0%	50,000	302,000
	Subtotal Reach A				\$358,340	19.8%	\$71,000	\$429,000
11.	Reach B, Revetment							
	excavation	9,000	CY	\$8.00	\$72,000	20.0%	14,400	\$86,400
	gravel bedding	1,900	CY	16.00	30,400	20.0%	6,080	36,480
	underlayer stone	5,500	CY	35.00	192,500	20.0%	38,500	231,000
	armor stone	8,800	CY	70.00	616,000	20.0%	123,200	739,200
	Subtotal Reach B				\$910,900	20.0%	\$182,180	\$1,093,000
11.	Reach C, Revetment							
	excavation	7,200	CY	\$8.00	\$57,600	20.0%	11,520	\$69,120
	gravel bedding	1,300	CY	16.00	20,800	20.0%	4,160	24,960
	underlayer stone	3,700	CY	35.00	129,500	20.0%	25,900	155,400
	armor stone	7,500	CY	70.00	525,000	20.0%	105,000	630,000
	Subtotal Reach C				\$732,900	20.0%	\$146,580	\$879,000
11.	Reach D, Revetment							
	excavation	15,000	CY	\$8.00	\$120,000	20.0%	\$24,000	\$144,000
	gravel bedding	1,600	CY	16.00	25,600	20.0%	5,120	30,720
	underlayer stone	4,700	CY	35.00	164,500	20.0%	32,900	197,400
	armor stone	6,500	CY	70.00	455,000	20.0%	91,000	546,000
	Subtotal Reach D				\$765,000	20.0%	\$153,020	\$918,000

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COST
ACCOUNT
NUMBER

ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
11. Reach E, Revetment Under Dunes & Concrete Cap							
excavation of sand dunes	36,000	CY	\$4.50	\$162,000	20.0%	\$32,400	\$194,400
gravel bedding	4,700	CY	16.00	75,200	20.0%	15,040	90,240
underlayer stone	4,300	CY	35.00	150,500	20.0%	30,100	180,600
armor stone	9,300	CY	70.00	651,000	20.0%	130,200	781,200
concrete	65	CY	300.00	19,500	20.0%	3,900	23,400
reinf. bar #5	80	LF	1.00	80	20.0%	16	96
Subtotal Reach E				\$1,058,000	20.0%	\$211,656	\$1,270,000
11. Reach F, Concrete T-wall, 940 LF							
excavation	3,220	CY	\$8.00	\$25,760	20.0%	5,152	\$30,912
compacted impervious fill	740	CY	12.00	8,880	20.0%	1,776	10,656
compacted gravel fill	1,530	CY	16.00	24,480	20.0%	4,896	29,376
stone protection	390	CY	40.00	15,600	20.0%	3,120	18,720
reinforced concrete	750	CY	350.00	262,500	30.0%	78,750	341,250
vehicle gate 12'	1	EA	40,000.00	40,000	30.0%	12,000	52,000
Subtotal Reach F				\$377,220	28.0%	\$105,694	\$483,000
TOTAL COST ACCOUNT 11. LEVES AND FLOODWALLS				\$40,952,482	22.1%	\$9,061,425	\$50,014,000

SADGUS RIVER

COST
ACCOUNT
NUMBER

ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
17. BEACH REPLENISHMENT							
Point of Pines - 100 Year Storm							
Beach B							
sandfill-from dune excavation	6,400	CY	4.00	25,600	20.0%	5,120	30,720
Beach C							
sandfill(from dune excavation)	7,200	CY	4.00	28,800	20.0%	5,760	34,560
Beach D							
sandfill-from dune excavation	3,400	CY	4.00	13,600	20.0%	2,720	16,320
Beach E							
sandfill(from dune excavation)	19,000	CY	4.00	76,000	20.0%	15,200	91,200
sand fence - 4' high	1,600	LF	4.00	6,400	100.0%	6,400	12,800
beach grass	14,000	SY	1.00	14,000	20.0%	2,800	16,800
TOTAL COST ACCOUNT 17. BEACH REPLENISHMENT				\$164,400	23.1%	\$38,000	\$202,000

SAGGUS RIVER

COST
ACCOUNT
NUMBER

ITEM DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY PERCENT	CONTINGENCY AMOUNT	TOTAL AMOUNT
TOTAL COST ACCOUNT 17. BEACH REPLENISHMENT				\$164,400	23.1%	\$38,000	\$202,000
=====							
19. BUILDINGS, GROUND AND UTILITIES							
Lynn parking							
pave parking lot (37,000 sf)	1	LS	45,000.00	45,000	20.0%	9,000	54,000
shrubs (3'-4' tall)	50	EA	25.00	1,250	20.0%	250	1,500
topsoil and seed	5,000	SF	4.50	22,500	20.0%	4,500	27,000
trees	15	EA	212.00	3,180	20.0%	636	3,816
Point of Pines - 100 Year Storm							
Reaches B-F along structures site restoration							
topsoil and seed	4,320	SY	4.50	19,440	20.0%	3,888	23,328
shrubs (2'-3'tall)	230	EA	18.00	4,140	20.0%	828	4,968
trees	6	EA	212.00	1,272	20.0%	254	1,526
precast concrete curb	3,570	LF	11.00	39,270	20.0%	7,854	47,124
Reaches B-F							
cross overs	13	EA	7,000.00	91,000	20.0%	18,200	109,200
Revere Beach Park Dike							
Dike, site restoration							
shrubs (2'-3'tall)	200	EA	18.00	3,600	20.0%	720	4,320
trees (replace)	30	EA	212.00	6,360	20.0%	1,272	7,632
TOTAL COST ACCOUNT 19. BUILDINGS, GROUND AND UTILITIES				\$237,012	20.0%	\$47,402	\$284,000
=====							

ATTACHMENT C

REGIONAL PLAN INUNDATION REDUCTION BENEFITS

REVISIONS TO ECONOMIC APPENDIX

FLOOD CONTROL ONLY DIKE VS. PARK DIKE

INUNDATION REDUCTION BENEFITS
 OPTION 3, REGIONAL PLAN, SPN DESIGN LEVEL
 (In \$1000 @ 1988 Price Level)

ZONE	AVERAGE ANNUAL BENEFITS		
	Residential	Commercial	Total
<u>Saugus</u>			
1	157	8	165
1c	—	39	39
2	493	61	554
3	283	12	295
		Saugus Total	1053
<u>Revere Beach Backshore</u>			
1 (100 yr.)	66	29	95
2A	—	79	79
2B	257	111	368
3	6	18	24
4A	298	35	333
4B	9	—	9
4C	8	62	70
5A	528	101	629
5B (Level Varies)	18	—	18
<u>Northgate</u>			
6	38	2	40
<u>Point of Pines (100 yr.)</u>			
7A (1)	206	11	217
7B (2)	446	2	448
7C (3)	553	16	569
7D (4)	206	4	210
		Revere Total	3109
<u>Lynn</u>			
1	560	836	1396
2	—	1107	1107
3	34	298	332
Rt. 107	—	67	67
		Lynn Total	2902
TOTAL REGIONAL PLAN BENEFITS			\$7064

REVISIONS TO ECONOMIC APPENDIX

Reference	Structures Affected, Revise to:					
Recurrence Interval:	10	20	50	100	500	SPN+1
Table 21	59	79	105	120	132	135
Table 24	94	106	122	132	144	144
Table 26	12	19	32	42	88	200
Table 40	35	52	65	74	77	77

ATTACHMENT D

REGIONAL PLAN

O&M COST SUMMARY

SAUGUS RIVER AND TRIBUTARIES
REGIONAL FLOODGATE PLAN
OPERATION AND MAINTENANCE COST SUMMARY
(1988 Price Levels, over a 100 year Project Life)

1. Floodgates	Average Annual O & M Cost	
a. <u>Major Contracts</u>		
<u>Painting and Repairs:</u>		
Navigation Gate(\$210k @10yrs)	\$ 13,900	
Flushing Gates(\$390k @20yrs)	7,700	
Pave Parking Area: (\$26k @15yrs)	1,000	
<u>Training by Corps</u>		
(3 yrs @ 20k/yr and ass't as needed)	5,500	
Total Contracts:	\$ 28,100	
b. <u>Labor</u> (MDC Rates including Overhead)		
<u>Project Manager & Engineers</u>		
(Admin., Inspec., Operations, Coord.)		
3.5 man-mo. avg. per yr. @ \$5,500/mo.	\$ 19,300	
<u>Gen. Maintenance, Operations & Coord.</u>		
(Maint., Inspec., Oper., Contracts)		
12 man-mo. avg. per yr. @ \$2,900/mo.	34,800	
<u>Security Officer for Floodgate Structure</u>		
2.3 man-mo. avg. per yr. @ \$3,200/mo.	7,400	
Total Labor:	\$ 61,500	
c. <u>Materials, Supplies and Equipment</u>		
<u>Monitoring Equipment, Vehicles, Tools, etc.</u>	\$ 10,000	w/CONTG.
Total Floodgates:	\$ 99,600	
	w/20% CONTG.	\$120,000
2. Park Dike		
(about \$6,300 is currently being spent to maintain the existing parkland)	7,900	
3. Revere Tide Gate & Ponding Area		
(about \$500 is currently being spent to cleanup the ponding area)	1,400	
	9,300	
	w/ 20% CONTG.	\$ 11,000
4. Point Of Pines		
(about \$5,700 is currently being spent to maintain existing walls, dunes and revetments)	7,200	
	w/ 20% CONTG.	\$ 9,000
5. Lynn Harbor		
(about \$5,100 is currently being spent to maintain walls and dikes)	8,300	
(Total maintenance cost currently being spent for items #2 - #5 is about \$17,600 per year)	w/ 20% CONTG.	\$ 10,000
6. Mitigation Site	2,000	3,000
7. Legal Cost \$10,000/yr.	10,000	12,000
8. Environmental Manager		
12 man-mo. @ \$3,000/mo. = \$36,000		
Vehicle, Office, Supplies, Boat = \$10,000	46,000	55,000
TOTAL PROJECT O&M PER YEAR		\$220,000

Saugus River & Tributaries
Floodgates O&M Labor

<u>Floodgate Yearly Labor</u> (in man-months)	<u>Proj. Mngr.</u> <u>/Engineer</u>	<u>General**</u> <u>Maint.</u> <u>or Operator</u>	<u>Security</u> <u>Officer</u>
1. Testing + Inspection: *			
(Rev'd from 1hr/day avg. to 1.3 hr/day)			
a.) MDC inspection + testing	0.5	0.5	-
w/ Corps: 2/yr. w/4 men @ 3 MD ea			
b.) Operate Gates 3/yr @ 3MD w/4 men	1.0	1.0	-
2. Routine Maintenance (see attached)	-	9.9	-
3. Floodgate Security and Estuary Inspections	0.3	-	2.3
4. Administration (Rev'd from 2 hr./day * to: Coord. Maint. Contrancts (2 man-mo/10 yrs) Assume 0.2 m-m Avg per year	0.1	0.1	-
5. Public Coord. (Rev'd from 2 hr./day to:** Meetings: 5/yr @ 2 MD -	0.5	0.5	-
Correspondence: 1 hr/week -	0.3	-	-
6. Agency Coord.* (Rev'd from 5 hr/day to same as Public Coord.)	1.0	-	-
	<u>3.5</u>	<u>12.0</u>	<u>2.3</u>
	man-months	man-months	man-months

Total Man-Yrs

* Reference: Design Appendix (O+M)

** Daily assignment should be at Floodgates, although can be used elsewhere.

<u>Floodgate</u> <u>Materials Equipment and Supplies</u>	<u>Average Annual</u> <u>Cost/Yr.</u>
Gen. Maint. Equip. & Tools	\$ 500.00
Grease & Lube	\$ 1500.00
Brochures (avg. ea. 3 yrs.)	300.00
Landscaping	200.00
Alarm Service	1500.00
Supplies	1500.00
Monitor Equip \$5000/10 yrs.	
$\$5000 \times 0.066 =$	330.00
Heating Fuel & Furnace Repairs	1500.00
Vehicles, gas, repair et. al	<u>2500.00</u>
Total =	9830.00 SAY \$10,000.00

Floodgate - Routine Maintenance

		<u>Man-Hours</u>
Vacation, Sick, Admin. Leave		160
Mow grass @ Parking Area	8 @ 4 hr. =	32
Shovel Snow	6 @ 8 hr. =	48
Grease gates	11 @ 4 hr. =	44
Painting (misc)	4 @ 8 hr. =	32
Clean up access ,grounds, walls	8 @ 24hr. =	192
Maint. electrical	2 @ 8 hr. =	16
Change filters & lube	4 @ 8 hr. =	32
Trouble shoot minor electmech problems	3 @ 40 hr. =	120
Replacement anodes (avg)	1 @ 8 hr. =	8
Maintain heat + Cool sys.	2 @ 8 hr. =	16
Replace lights	1 @ 8 hr. =	8
Replace gauges + records	12 @ 8 hr. =	96
Other routine duties and coordination	260 @ 3 hr. =	<u>780</u>
		1584 hrs.

9.9 man-mo.

Floodgate Security & Estuary Inspection (MDC Police, et.al.)

Floodgate security (avg.) 1hr/day	=	365 hrs. = 2.3 m-m
Estuary inspections 2 @ 24 hr.	=	<u>48 hrs.</u> = 0.3 m-m

Corps Effort

Train MDC in Regulating Gates for 3 years @ \$20 k/year (factor 0.225)	\$ 4500
Operation and Technical Assistance as needed over project life	<u>1000</u>
	\$ 5500

Note: Corps inspections of completed projects
are financed by the Federal Government.

ENVIRONMENTAL MANAGER

<u>TASKS/YEAR</u>	<u>EFFORT</u> (Man-Days)
1. Monitor & Inspect Wetland Storage Area 12 @ 5 MD	60
2. Coord. & Technical Assistance to Conservation Commissions 6 @ 3 MD	18
3. Review, Coord. & Comments on Permit Actions 10 @ 3 MD	30
4. Legal Action, Coord., Investigations 1 @ 20 MD	20
5. Training 1 @ 5 MD	5
6. Public Awareness Program & Brochures 11 @ 5 MD	55
7. Identify Wetland Boundaries for Property Owners 10 @ 1 MD	10
8. Agency & Interest Group Coord. 15 @ 1 MD	15
9. Vacation, Sick, Admin. Leave	20
10. Monitor Mitigation Site	<u>5</u>
TOTAL	238 MD
SAY	11.9 Months
	12 Months

Saugus River & Tributaries
Navigation Miter Gate Maint. Cost.

NAVIGATION GATE COSTS*

Reference: Appdx D. pg O&M-11-13

<u>Location</u> <u>/size</u>	<u>Contract</u> <u>O&M</u> <u>Cost/Gate</u> <u>(\$1000)</u>	<u>Contract</u> <u>Interval</u> <u>Years</u>	<u>Fresh/Salt</u> <u>Water</u>
<u>Norfolk</u> lock sys. 30'X50' leaf	\$ 80k	10-15 years	Salt/Fresh
<u>Nashville</u> lock	\$80K (\$40-120)	15	Fresh
<u>Huntington</u> locks 65X25 leaf	\$295K	?	Fresh
<u>New Orleans</u> 50'37' leaf locks	\$250K	10-15 years	Fresh
<u>Seattle</u> (not used)	(\$840K)	20	Fresh/Salt
<u>Walla Walla</u> Locks w/43'X 55' leaf	\$100K	4-5	Fresh
<u>Rock Island</u> 110' wide	(\$20-30) \$ 25K	15	Fresh
Average Cost	<u>\$138K</u>	<u>12 years</u>	

Add 50% : to reflect a salt water environment

Use \$210K @ 10 yrs.

Avg. Ann. Cost factor: $0.0662 * \$210k = \$13,900/\text{yr.}$
(Every 10 yrs. $8 \frac{7}{8}\%$ 100 yrs.)

- * O&M costs include: painting gates, hydraulic fluid, anodes for cathodic protection, structural testing and repairs, welding or replacement of skin plates, consultants, seals and so forth.

SENE: Saugus River & Tributaries
Flushing Tainter Gates O&M cost

FLUSHING TAINTER GATES O+M
Reference: APDY D: pg O+M - 11-13

<u>Location</u> <u>/size</u>	<u>Contract</u> <u>O+M Cost/gate</u> <u>(\$1000)</u>	<u>Equiv. No.</u> <u>of gates</u> <u>(@15'X50')</u>	<u>O+M Cost</u> <u>per 15X50'gate</u> <u>(\$1000)</u>	<u>Interval</u> <u>Years</u>	<u>Fresh/</u> <u>Salt</u> <u>Water</u>
<u>Vicksburg</u> 50'X35' # of Gates?	\$55K('78) (77K '89)	2.3	\$33	-?	Fresh
<u>Huntington</u> 30'X110' -equivalent to 4 SENE gates 12 ea.	\$91.7k	- 4.4 =	21	25 yrs.	Fresh
<u>ALSO</u> @ 9 gate (cable repair)	\$ 111k	- 4.4 =	25	15 ys.	
<u>Los Angeles</u>	\$20k	?	20	(5)	Fresh
<u>Jacksonville</u>	\$43k	- ? =	43	-	Salt
<u>Seattle</u> 10'X32' @ 6 gates	\$83k	- 0.4 =	(208)not used	?	Fresh/Salt
<u>Walla Walla</u> 50X50 @ 6 gates	\$50k	- 3.3 equiv.	15	20	Fresh
<u>Rock Island</u> @ 20 gates	\$50k	- ? =	?	15-20	Fresh
<u>Little Rock</u> 30'X50' @ 15g	\$57	- 2.0	29	15	Fresh
<u>Pittsburg</u> 30'X110' @ 2	\$100	- 4.4 =	23	-	Fresh

AVERAGE

Add 50%: \$ 26/gate 18.5 yrs.

for salt water

Use \$26K/gate *1.5 * 10 gates = \$390K @ 20 Yr. interv.

10 GATES (15'X50')

AVERAGE ANNUAL COST:

Factor 8 7/8% @ 1000 yr interval & 100 yrs: 0.01982 * \$390K =7,700/yr.

* O&M Costs include similar work as the navigation gate.

OPERATION AND MAINTENANCE
OTHER PROJECT FEATURES
 (Reference: DESIGN APPENDIX)

<u>Park Dike</u>	Estimated Current Shorefront O&M Costs	Total Annual O&M Cost
. Mow lawns (no increased cost)	\$3,348	\$ 3,348
. Shrubs-prune	-	753
. Shrubs-weeds	-	653
. Shrubs-fertile	-	171
. Prune & fertilize trees (no increased cost)	2,976	2,976
(Carey Circle revetment (see Point of Pines))	-	-
	\$6,324	\$ 7,901
	SAY \$6,300	SAY \$ 7,900
<u>Revere</u>		
. Gravity wall-Repair, Inspect, mow	-	\$ 419
. Ponding area-Inspect, remove debris	\$ 480	\$ 480
. Sales Cr. Tide Gate - Clean, repair, replace	-	\$ 500
	\$ 480	\$ 1,399
	SAY \$ 500	SAY \$ 1,400
<u>Point of Pines</u>		
. Revetments (no increased cost)		-
. Sand Dunes (grade sand & natural nourishment, maintained by city & Assoc. - no increased cost)		-
. Sand Fencing 1700 LF @ 5¢ replace		\$ 182
. Access Walks over walls (no increased cost)		-
. Access dune cross-overs (labor + matils) timber		\$ 1,000
. Concrete Wall - (no increased cost)		-
Toe drain inspection		55
. Landscaping: revise to existing features replaced plus shrubs		\$ 232
. Access Vehicular Gate		\$ 145
		\$ 1,614
		SAY \$ 1,600
<u>Lynn Harbor</u>		
. Dikes (no increase in mowing or rip rap replaced) Herbicide & toe drain inspection		\$ 784
. Steel Wall (Rev'd to 1/3 of cost for Gloucester Corp. new wall, rest is currently protected)		\$ 1,500
. Concrete wall (new)		\$ 922
		\$ 3,206
<u>Mitigation Site</u>		
. Inspect & Maintain		\$ 2,000

(89-18)

ATTACHMENT E

Letter of Response from NED Corps of Engineers to U.S. Fish and Wildlife
Final Coordination Report prepared prior to the Public Review of the draft
report. The U.S. Fish and Wildlife Letter dated May 4, 1989 appears in
Appendix I, Volume 5, page C25.



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

June 15, 1989

Planning Division
Basin Management Branch

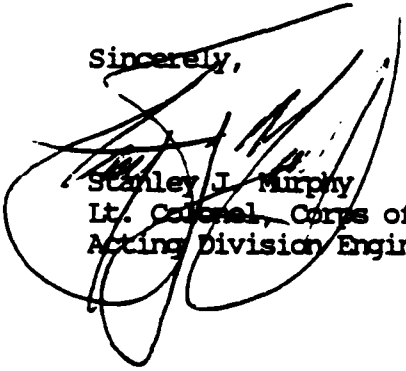
Mr. Gordon E. Beckett
Supervisor
New England Area
U.S. Fish and Wildlife Service
22 Bridge Street
Concord, New Hampshire 03301-4901

Dear Mr. Beckett:

This is in reply to your Final Fish and Wildlife Coordination Act Report dated May 4, 1989 on the Saugus River and Tributaries, Flood Damage Reduction Study. I appreciate your thorough review of the Pre-release Draft of the Feasibility Report and EIS/EIR. Major concerns relate to plan selection, induced development, future conditions, Lynn Harbor dikes and fish passage. The attached Corps response to each of your comments answer your concerns in detail.

The results of our study as presented in the report were developed using the latest principles and guidelines and supporting regulations and policies. I hope these comments clarify your concerns. If you have any questions, please call me at (617) 647-8222 or the Project Manager, Mr. Robert G. Hunt (647-8216).

Sincerely,


Stanley J. Murphy
Lt. Colonel, Corps of Engineers
Acting Division Engineer

Enclosure

CORPS OF ENGINEERS RESPONSES TO THE U.S. FISH AND WILDLIFE SERVICE
FINAL PLANNING REPORT COMMENTS

1. F&W Comment: Option 2 is a non-structural plan which involves floodproofing buildings, flood warning, and evacuation procedures. a. This is the option we recommend because it would not adversely impact fish and wildlife resources. b. It also has the highest benefit:cost ratio of the alternatives considered. c. We understand the Corps does not consider option 2 to be feasible because of the lesser level of flood protection it offers.

Corps Response:

1a. Three alternative plans (Options 1, 2 and 3) were identified in the planning process to be studied in the feasibility phase. The selection of a recommended plan is based on a comparison of all of the evaluated effects, not just one.

1b. Net economic benefits, which is the difference between average annual benefits and average annual cost, is an indicator of economic efficiency. The plan which maximizes net economic benefits is known as the National Economic Development (NED) plan, and, except where unusual overriding considerations exist, is selected as the recommended plan.

1c. Option 2, the Nonstructural plan, is one of the plans studied and is feasible but it is not the NED plan.

2. F&W Comment: The study area encompasses about 4000 acres that are considered the floodplain of the estimated worst possible coastal storm, the standard project northeaster (SPN). Approximately 40 percent of the SPN floodplain consists of the Saugus-Pines River estuary, which at 1,660 acres, is the largest estuary near Boston. The estuary and its environs support a variety of fish and wildlife resources including marine and anadromous fish, shellfish and other invertebrates and migratory birds.

The Saugus-Pines River estuary and Lynn Harbor have been designated a special management area under the North American Waterfowl Management Plan because of the high habitat value for waterfowl and the eminent threat of habitat destruction, including impacts from this project. We consider the estuarine habitat potentially affected by the project to be of high value for migratory birds and both marine and anadromous fish. This habitat type is becoming scarce along the New England coast. Our mitigation goal is to allow no net loss of existing habitat value.

Corps Response 2. NED agrees this estuary has high ecological value. Our mitigation (Appendix K) clearly defines mitigation of unavoidable impacts at a 1:1 ratio. We feel transplanting of clams to the intertidal habitat will provide no net loss of existing habitat value.

3. F&W Comment: Despite our extensive coordination with the Corps, we continue to have significant concerns regarding the proposed project. These include: inadequate consideration of alternatives, particularly non-structural ones; the effect of the project on floodplain development and wetland protection; intertidal habitat losses from levee construction within Lynn Harbor; fish passage impacts from flow constriction at the mouth of the Saugus River; and the potential for wide-scale ecological impacts within the estuary from increased floodgate operation in the future.

Corps Response 3: As discussed in the following sections, the planning process has considered all of the referenced impacts.

4. F&W Comment: Because of these unresolved issues, we cannot support the project as proposed. At this time, we can support only Option 2, the non-structural plan. This option is the least environmentally damaging and would not adversely impact wetlands or fish and wildlife resources.

Corps Response 4: The Environmental Impact Statement also identifies Option 2 as the least environmentally damaging plan. The selected plan (Option 3) provides the maximum net economic benefits. Option 3 represents selection of the plan that provides the maximum net benefits and is consistent with all applicable environmental, engineering and economic considerations and is supported by the affected communities.

5. F&W Comments: a. Elements of the non-structural option should be more fully developed and the alternative expanded to include all potential non-structural flood control measures. Option 2 considered only two elements: the suitability of structures for floodproofing and an early warning and evacuation plan. It appears that these elements were not evaluated with the same level of detail as the structural alternatives. b. For example, the study concluded that floodproofing was impractical since only 240 buildings were found to be suitable for floodproofing measures. c. However, it appears that floodproofing opportunities in the study area were not fully considered, since only 2685 of the 5000 flood-prone buildings in the study area were investigated for floodproofing potential. The rationale behind this apparent difference in baseline assumptions between alternatives (e.g. how many buildings are subject to flooding) should be spelled out in the final report.

Corps Response 5:

5a. The nonstructural plan evaluated raising buildings, closures, ring walls, flood insurance, relocation of buildings, flood warning, utility cells and rooms, flood plain management, and flood plain and estuary acquisitions.

5b. The study did not conclude that flood proofing was impractical. Option 2 is one of the three potentially viable options carried into the feasibility study for further evaluation of effects (see Responses to Comment #1).

5c. Nonstructural measures were evaluated for each building in the floodplain for which substantial tide related flood losses would be realized. The remaining buildings which would incur only minor tide related flooding were not evaluated for benefits from either structural or nonstructural measures. Reference: Main Report page 49.

6. F&W Comments: a. The National Flood Insurance Program (NFIP) was not considered as a non-structural alternative despite the fact that all four of the communities within the study area -- Saugus, Lynn, Revere, and Malden -- participate in the program. b. According to the Federal Emergency Management Agency (FEMA) about 1100 NFIP policies are in affect in these communities. c. Average annual flood damage claims under all of these policies were just under \$400,000 over the last 12 years, including 1978, the year of 100-year storm event. This figure contrasts sharply with the Corps' estimate of over \$8,000,000 in average annual flood damages. d. The low flood insurance participation and damage payment rate suggest that: the occupants of the study area do not consider flooding to be a serious or chronic problem (i.e. low risk); most of the annual flood damages are not severe (i.e. nuisance flooding); or perhaps some structures are not considered worth insuring by their owners. e. It is also possible that the NFIP is an under-utilized resource and that opportunities exist for expanded participation/coverage as part of a non-structural flood control plan. f. We recommend that the various non-structural options be evaluated with the same level of detail as the structural options. Alternatives to the proposed action should be given full consideration in the final EIS to fulfill the intent of the National Environmental Policy Act.

Corps Response 6:

6a. The National Flood Insurance Program (NFIP) is considered in the study. Information at the very start of the investigation in 1986 and earlier was obtained to evaluate the effectiveness of the program to reducing flood losses.

6b. Agree. According to FEMA, as of Spring '89, 1062 NFIP policies are in effect. In addition, the amount of insurance written for these policies is \$58,593,100.

6c. Approximately \$400,000. is correct if based on straight line average. NFIP average annual flood damage claims however, are not comparable to the Corps' estimate of average annual flood damages and should not be used as a proxy for the following reasons:

1. NFIP claims are only for residences and small businesses. Single family residences are limited to \$185,000 of insurance and other residential buildings to \$250,000. Small businesses are limited to \$250,000 and \$300,000 for contents. Much of the Corps' estimated damages in the study area are for industrial and commercial properties not covered by NFIP.

2. NFIP claims are for damages over and above the deductible of \$500.00.

3. The Corps' estimate of average annual flood damage is based on a hydrology frequency function computed over the long-term from historical flooding records, not a straight-line average over 12 years.

4. The Corps' estimated average annual damages include non-physical costs such as for family lodging and food when having to evacuate homes during flood events.

5. NFIP insurance does not cover residential basement contents. Corps' estimated damages include those for basement furnishings, carpets, tools, sporting goods, cleanup, etc.

6. The Corps' estimated damages include damages to automobiles, grounds, fencing, driveways, storage shed, pools and landscaping.

7. The Corps' estimated damages are replacement value or reconstruction value where insurance claims are for depreciated values.

6d. Disagree. The flood insurance participation rate has more than doubled since 1978. On February 28, 1978 there were 452 NFIP insurance policies in place written for roughly \$10,000,000 in the four communities. Today, there are 1062 policies in effect written for close to \$59,000,000., six times the 1978 amount.

6e. The NFIP is a heavily utilized program in the study area. The 100 year flood plain in Lynn, Saugus and Revere includes 2077 residential and commercial damage surveyed properties subject to flooding. As of Spring 1989, 1007 NFIP insurance policies in these three communities (1062 including 55 for Malden) are in effect written for \$55,830,200. The Corps estimate of recurring flood losses for a 10 year event are \$18,000,000 and for the 100 year event are roughly \$100,000,000.

6f. See Responses to Comments 5 and 6a.

Reference Source: FEMA.

7. F&W Comments: a. We believe the project is inconsistent with the current Federal philosophy to avoid development in estuaries, coastal areas susceptible to flooding, floodplains, and wetlands.

Corps Response 7:

a. Induced development was identified as a potential major impact at the beginning of the study and an independent consultant was hired by the Corps to study this issue. Results of that study indicate that the project would not exhibit a significant impact on development due to the existing regulatory protection of the wetlands, which would not change, and to marginal cost savings expected to accrue to new construction in areas adjacent to the wetlands, particularly the avoidance of flood-proofing costs. It was found that development decisions in the study area were far more sensitive to factors such as interest rates, demand and supply for housing, location factors such as nearness to transportation facilities and water, etc. There is very little undeveloped land left in the study area and typical of most highly developed urban areas more intensive development is simply taking place largely at the expense of existing less intensive developments. No major land use changes are occurring or are foreseen with a project. The EIS defines the compliance of this action with all pertinent environmental laws, regulations and executive orders.

8. F&W Comments: a. We believe the proposed project is inconsistent with the mandate of Executive Order 11988 to discourage floodplain development and to restore and preserve the beneficial values served by

floodplains. b. Rather than preserving or restoring floodplain values, the project would result in a reduction of the area designated as floodplain and/or redesignation to a less restrictive floodplain classification. c. This in turn will likely result in increased development around the perimeter of the estuary and the loss of beneficial floodplain values, including fish and wildlife habitat.

Corps Response 8:

8a. See Response to Comment 7.

8b. Yes, the project by design will result in a reduction of the flood plain.

8c. However, the marginal savings in the cost of the construction will not have a significant impact on development. (See Response to Comment 7.)

9. F&W Comments: a. We disagree with the claim that the floodgate plan will greatly enhance wetland and floodplain protection within the study area. The project would not change regulatory protection of the marsh. It is suggested (by the Corps) that added protection would occur through the proposed "estuary storage protection program". b. Existing wetland regulations have been less than completely effective in preventing incremental wetland losses in the past and it is unlikely that they will do so in the future. c. Over half of the wetland losses investigated by the Corps over the last 10 years were from permitted activities, i.e. activities authorized by the Corps. d. Following project construction, annual wetland losses may increase as a result of growing pressures to fill and develop wetlands. e. Even with the Corps' projection that the current annual wetland loss rate of 0.5 acre/year will continue, 50 additional wetland acres in the estuary storage area will be lost during the project life.

Corps Response 9:

9a. Existing Federal, state and local regulatory measures pertaining to the salt marsh will remain in effect with a project. The features of the estuary storage protection program were developed in consultation with agencies and organizations charged with estuary protection who specifically requested wetland mapping, technical assistance, points of contact and public education measures to help improve regulatory protection.

9b. Disagree. See 9a above.

9c. Disagree. From 1978 to 1988 fill was detected at 12 sites covering a total area of 4.7 acres, while 83 percent of the number of sites (10) and area filled (3.9 acres) were illegally filled.

9d. Disagree. As a result of an enhanced enforcement program being implemented in the estuary, in association with this study, numerous calls from environmental groups and residents were received and responded to. Between July and November 1988 the Corps Regulatory Branch issued 7 Cease and Desist Orders for sites around the estuary. As of December 1988 2 cases have been voluntarily restored, 2 cases were preparing plans for voluntary restoration and 1 case was being negotiated with restoration as the primary objective. The 2 remaining cases had just been initiated and their disposition was dependent on a response from the individuals.

Delineating flood storage areas on maps and denoting their importance for storage are part of the features for Option 3, the Regional Plan, which also includes the estuary storage protection program. As a result, implementation of Option 3 should cause annual wetland losses to decrease.

9e. A continued loss of 0.5 acre per year applies to the without project condition; with the project the loss would be less than without it.

10. F&W Comment: If long term protection of the estuary storage area is essential for successful project operation, we recommend that the Corps formulate a more definitive plan for protecting floodplain and wetlands within the project area, e.g. acquisition of land or flood easements.

Corps Response 10:

Acquisition or permanent easements of the estuary floodplain was in fact evaluated and would have cost over \$5 million. The expenditure would not have eliminated the need for the estuary storage protection program as illegal fills would likely have remained a concern. Among other requirements, the "estuary storage protection" program includes preservation of the storage area as an item required in the Regional project's local assurances.

11. F&W Comments: a. We continue to be concerned with the unnecessary loss of productive intertidal habitat from structural protection measures along the Lynn Harbor shorefront. This area is important not only for shellfish, such as blue mussels and soft shelled clams, but for waterfowl that feed on the rich invertebrate resources. b. It is our understanding that 5.6 acres of fill in intertidal habitat could be avoided through the use of either setback levees or vertical walls. c. A similar reduction in impacts could be expected for option 1 if alternate structural measures were used. Less damaging alternatives have been eliminated from further consideration as they are considered cost prohibitive. d. However in the cost breakdown for shorefront protection along Lynn Harbor (p.70, Feasibility Report), the average cost per foot for dikes is \$628, while the average cost per foot for walls is \$478. It appears that, on average, walls would cost less than dikes. e. Even if less damaging alternatives such as walls or setback levees would cost more, it is our understanding that the overall benefit:cost ratio for the regional flood control project would still remain positive if they were implemented.

Corps Response 11:

11a. The Corps' agrees that it is important to protect areas rich in shellfish habitat and the feeding ground for waterfowl which feed on rich invertebrate resources. The areas that would be impacted by Option 3 structures do not support high Mya numbers (sampling average about 50/m²). Mussels are in good numbers along the Lynn Harbor bulkhead (up to 100/m²). However, the most important feeding grounds for waterfowl are near the mouth of the Saugus River, under and around, as well as upstream of the General Edwards Bridge, on the Saugus River, and out on the flats of Lynn Harbor.

11b. The cost to move the Lynn Harbor dike inland to avoid loss of most of the 5.6 acre intertidal habitat is an increased cost of \$4 million. Use of walls would cost \$8 million more. Mitigation of the impact adjacent to the Sea Plane Basin would be about \$200,000. It would appear practical that such a savings is worth mitigating the impact. See the incremental analysis in Appendix K to the Draft Report for further details.

11c. True, but choice of lowest cost alternatives is consistent with Federal Policies, in particular the Water Resources Council's Principles and Guidelines. There must be overriding reasons to recommend other alternatives and in this case we believe no exception exists.

11d. The cost you quote for dikes and walls in the Pre-release Draft Report at \$628 and \$478 respectively, does not apply to the dikes and walls needed to reduce the impact along Lynn Harbor. Along Lynn Harbor these costs for a dike moved inland and walls are \$2060 and \$3250 per foot, respectively. The increased costs are about \$4 and \$8 million for dikes and walls, respectively, along 4400 feet of Lynn Harbor shorefront, to eliminate most of the impact.

11e. True, the benefit-to-cost ratio would remain positive, however, the cost efficiency would be substantially reduced thus significantly lowering the project's net benefits.

12. F&W Comments: a. The development of less damaging practicable alternatives mandated by the Section 404 (b)(1) Guidelines has apparently been overridden by the Corps policy of developing the least cost alternative. b. Development of the NED plan does not preclude the need to protect the environment. It appears that the Corps has assumed that the NED level of benefits cannot be achieved without omitting the full cost of environmental protection. This position is contrary to the Federal objective, as national economic development must be accompanied by protection of the environment.

Corps Response 12:

12a. This is not Corps policy. The least cost alternative is not the criteria for plan selection by the Corps. Net economic benefits, the difference between average annual benefits, and average annual cost, is an indicator of economic efficiency.

12b. The Federal objective is achieved in water resource planning by maximizing net benefits in plans that are consistent with protecting the nation's environment.

13. F&W Comments: The use of economics as the primary planning criteria is also inconsistent with Federal laws and guidelines that call for fish and wildlife to receive equal consideration with other project purposes (Fish and Wildlife Coordination Act) and which promote a step by step mitigation process emphasizing impact avoidance and minimization before compensation (Section 404(b)(1) Guidelines, the National Environmental Policy Act, Executive Order 11990, and the Fish and Wildlife Service Mitigation Policy).

Corps Response 13:

Economics is not the primary planning criteria. The selection of a recommended plan is based on a comparison of all the evaluated positive and negative effects, not just one. Full consideration was given to impact avoidance and minimization. Avoidance was not considered practical because of its additional 4 to 8 million dollar project cost. Adequate compensation of habitat losses will be accomplished at a \$310,000 project cost. This is consistent with Section 404(b)(1) Guidelines, the National Environmental Policy Act and Executive Order 11990, as well as Corps Policy.

14. F&W Comments: We support the concept of fully mitigating all project impacts to fish and wildlife resources. However, we cannot support the proposed compensatory wetland and intertidal mitigation plan for several reasons. First, there are practical alternatives for avoiding impacts that would better meet the stated project objective to reduce flooding with the least possible disruption to natural resources of the study area (p. 31, <Pre-release Draft> Feasibility Report). The proposed project does not accomplish this objective, since less damaging alternatives were identified, yet were not included in the preferred plan.

Corps Response 14:

Option 1 represents an impact to nearly 40 acres of wetland and intertidal habitat that would be mitigated. Option 2, the non-structural alternative will not have any significant ecological impacts. Option 3 requires mitigation for 10 acres of intertidal and subtidal habitat. Although Option 2 is the least damaging alternative, it is not the preferred plan since it does not maximize national economic development benefits and other plan selection criteria discussed in the report. Also, as previously discussed, moving dikes inland or using walls along Lynn Harbor for Options 1 or 3 is impractical due to the substantial increased costs of these alternatives.

15. F&W Comment: Second, there would still be a net loss in habitat for some of the important waterfowl species that utilize intertidal flats in Lynn Harbor. Lynn Harbor and the Saugus-Pines River estuary comprise the Greater Boston focus area, a special management unit designated by the Atlantic Coast Joint Venture under the North American Waterfowl Management Plan (NAWMP). The Lynn Harbor intertidal flats, important as a low tide feeding area for black duck and wintering habitat for a variety of diving duck species, are among the priority waterfowl habitats the Atlantic Coast Joint Venture seeks to protect. We disagree with the Corps' assumption that impacts to wintering black duck would be mitigated by blue mussel colonization of the proposed rock-covered dikes. Black duck have been observed utilizing intertidal flats directly adjacent to the existing Lynn Harbor walls. Presumably the site offers a unique combination of habitat features that waterfowl find attractive. In addition to the food value of the tide flats (they are among the first exposed as the tide recedes), it is likely the adjacent walls have value as cover and offer protection from wind and weather under certain conditions. The sloping dike face would be more exposed and would not offer similar cover benefits. It would also not support the same invertebrate communities as the existing tide flats. We have no reason to expect ducks that presently feed on intertidal flats would forage equally

well among the rock riprap. We also would not expect waterfowl and other migratory birds to just simply move over to the mitigation site in the Seaplane Basin after their habitat is eliminated in Lynn Harbor.

Corps Response 15:

The EIS recognizes that the impact will occur and that mitigation of unavoidable impacts would minimize the overall ecological disturbance. The purpose of the EIS is to fully disclose these impacts so an informed decision can be made, weighing the public benefits (flood protection) of the project against the ecological disturbances. It is our understanding that the area along the base of the Lynn bulkhead, while used by waterfowl, including black ducks, is not amongst the favored areas.

16. F&W Comments: Protection of Atlantic Coast habitat for black duck is identified in the NAWMP as an international priority. The Cooperative Agreement between the Department of the Interior and the Department of the Army regarding Waterfowl Habitat Conservation at Civil Works Projects calls for the Army to work with the Service in the planning of new civil works projects to avoid or minimize impacts to waterfowl habitat, consistent with the Fish and Wildlife Coordination Act and the goals of the NAWMP. Our recommendation for mitigating impacts to black duck habitat in Lynn Harbor is to completely avoid habitat loss by selecting a less damaging alternative.

Corps Response 16:

The preliminary project plans were coordinated with state and Federal agencies concerning impacts to black duck habitat. This process defined a potential conflict from a proposed dredging footprint that would directly remove a portion of an isolated, low-intertidal blue mussel (*mytilus edulis*) bed. The dredging location was reevaluated and altered thus avoiding this impact. This avoidance and the probable colonization of mussels on the new structures represents adequate mitigation of impacts.

17. F&W Comment: Finally, we are not convinced that all functional values of project-impacted wetlands can successfully be duplicated with any predictable degree of success. Wetland creation in the regulatory arena has a less than perfect success record. Strict reliance on a 1:1 habitat replacement ratio supposes that the replacement habitat will be equal in all respects to habitat destroyed by the project. We have already shown that waterfowl habitat values will not be equal. Since we believe it is not possible to guarantee that all habitat values will successfully be recreated, we will continue to recommend a minimum 2:1 compensatory mitigation ratio to allow for a reasonable margin of safety.

Corps Response 17:

Nationally the Corps has experience with clam flat construction. Given the proposed location of the flat, adjacent to Sea Plane Basin, we anticipate a high success rate for *Mya arenaria* recolonization. Sea Plane

Basin itself was originally not at an intertidal level. It now (after being excavated post WW II) supports a diverse benthic infauna and clam populations approximately the same as those areas being mitigated for. NED intends to construct, transplant and monitor the flat to assure successful mitigation. Concerning wetlands, the proposed mitigation for the non-selected option 1 is at a 1:1 ratio, plus an additional 177 acre-years (17.7 acres x 10 years / 100 years = 1.8 acres) for the time required for the constructed wetlands to approach the ecological value of the wetlands they are replacing. The selected Option 3, as you know, would not cause any wetland losses.

18. F&W Comment: The proposed floodgate has been modified during the planning process to alleviate many of the environmental problems of earlier designs. As noted in our previous comments, our remaining concern is with the potential for fish passage impacts from the constriction of tidal flow at the mouth of the Saugus River. The proposed design would constrict daily tidal flows through the flushing gates when water levels are above the 0.0 foot elevation of the upper gate openings, causing pressure flow conditions. As a result, planktonic fish eggs, larvae, and weak swimming juveniles may be impinged or otherwise damaged as they are forced through the gate openings under pressure. Organisms may also be injured or experience increased predation following contact with shear zones associated with turbulent eddies formed by flow constriction. Early life stages of winter flounder and rainbow smelt may be affected during ebb tides; Atlantic herring during flood tides.

Corps Response 18:

The EIS and Appendix K describe in detail our concerns for these unavoidable impacts. The large size of the flushing and navigation gates, as well as likely placement of rounded edges on gate abutments, are all intended to minimize these impacts.

19. F&W Comments: A related concern is that the structure may hinder the passage of surface oriented fish, since the upper portion of the water column would be obstructed at tide levels above 0.0 feet. Vertical distribution in the water column can be important for fish migration. Some species are known to use tidal currents in the upper water column for transport between estuarine and marine waters.

Corps Response 19:

Your concern for fish passage in the upper part of the water column above El.0.0 would be addressed during design when modelling would evaluate flow restrictions through the gates. The surface fish will not be obstructed, however they would be constricted to the 100 foot navigation opening.

20. F&W Comments: The Feasibility Report indicates that rounded gate openings would be considered during the design of the floodgate to aid in smooth flow transition through the gates. In addition to using rounded gate openings, we recommend that the floodgate structure be designed to allow unrestricted tidal exchange throughout the water column at all of the flushing gates. This should substantially reduce the potential for fish passage/impingement impacts.

Corps Response 20:

The 100 foot wide navigation gate will provide unrestricted passage. The flushing gates may impede fish passage only at higher tidal levels. See Corps Response 19.

21. F&W Comments: Finally, the issue of the elevated sill on the navigation gate is unresolved. We recommend that the sill for the navigation gate be flush with the river bottom, similar to the flushing gates, to facilitate demersal fish and lobster passage. If the bottom of the gates cannot be made flush with the river bed, we recommend that an inclined apron be used to aid fish passage over the vertical gate sill.

Corps Response 21:

All flushing gates will be flush with the river bottom or have inclined ramps. This provides 500 linear feet out of the total 600 feet of subtidal opening for passage. An additional 100 feet of opening in the navigation gate has an inclined ramp on the estuary side. An inclined ramp on the ocean side which would also be adequate for a gate seal would be evaluated during design.

22. F&W Comments: One of our initial concerns with the proposed floodgate design was the potential for wide-scale estuarine impacts from changes in tidal flushing and water quality parameters under both open and closed gate conditions. Flushing impacts during open gate conditions have been substantially reduced by increasing the open area of the flushing gates. The potential for significant water quality impacts during closed gate conditions still exists. Impacts would be primarily associated with the retention of thermal, biological and chemical pollutants from a variety of sources within the estuary.

The Corps' conclusion that the project will cause only minor water quality impacts is based on the assumption that the floodgate would operate very infrequently (approximately 2 to 3 times per year) and that closures would be of short duration (typically 1 to 2 hours). The impact of the preferred floodgate option on the overall ecology of the Saugus-Pines River estuary will gradually increase in the future as sea level continues to rise and the floodgates are operated more frequently. It is estimated that the floodgate would close 35 to 40 times per year for 2-3 hours per closure if the historic rate of sea level rise continues over the 100-year project life (a 0.8-foot rate of rise). The 4.2-foot sea level rise projection would result in 575-600 floodgate closures per year and a 5-6 hour duration per closure. Floodgate closure could be even more frequent under higher projections of sea level rise (EPA's "mid-high" and "high" projections are approximately 5.8 and 9.2 feet for the next 100 years, respectively).

Increasing floodgate closure frequency will result in significant impacts to the estuarine environment. As described in the DEIS, adverse impacts include: reductions in marsh sedimentation rates resulting in a decreased ability of the marsh to keep up with sea level rise; changes in the vegetative composition of the marsh from reduced frequency of tidal inundation; and impacts to water quality from increased storage of pollutants and thermal discharges and reduced dissolved oxygen and salinity levels.

As a result of rising sea levels, the number of gate closures to prevent flooding from astronomic high tides, as opposed to storm-related flooding, would gradually increase. Under present conditions, the Corps assumes that mixing from storm-related wind and wave action will help prevent water quality degradation from pollutant concentration during closed gate conditions. As routine closures to protect against astronomic high tides become more common, storm-related wind and wave mixing would not necessarily be present to mitigate the impact of confined pollutant discharges during closed gate conditions.

Corps Response 22:

You indicate that the 4.2 foot sea level rise would significantly impact the estuarine environment due to a potential 575-600 floodgate closures per year for a 5-6 hour duration each. This would indeed be the case if sea level actually rose 4.2 feet and the floodgate were in fact operated in this manner. It is highly unlikely either would occur. There is no definitive scientific data suggesting that the sea level would rise four times the rate it has in the past. However, if it was determined in 20-30 years that a rate much exceeding one foot would occur, the project would need to be evaluated to determine, once again, adjustments in the height of the shorefront to maintain a high level of protection and assure no significant impact on the estuary.

23. F&W Comment: We are concerned that these widespread impacts to the estuarine environment could also be realized in the absence of sea level rise, depending on how the project is operated in the future. The issue of who would operate and maintain the project is presently unresolved. Avoidance of environmental impacts is dependent on adherence to strict operational constraints. Regardless of the constraints established during the planning process, changing social/political pressures over the project life may dictate different operational regimes in the future. These in turn could cause more severe impacts than those presented in the Feasibility Report for existing conditions. As long as the floodgate structure is in place, the potential for operational impacts will exist.

Corps Response 23:

Project assurances require the project to be operated according to an Operation Manual prepared by the Corps. Federal funding of this project requires strict adherence to the operating criteria and overall operation and maintenance requirements established by the Corps. Whether or not the Corps operates the floodgates, the Corps is responsible to see that the assurances are met and the project is used for the intended purpose authorized by the Congress. In addition, the project would undergo semi-annual inspection to assure features are operational and maintained.

24. F&W Comments: Non-structural solutions for reducing flood damage in the study area would best accommodate natural wetland expansion processes related to sea level rise. For this study, it is assumed that owners of developed properties surrounding the estuary would erect vertical barriers to prevent marsh expansion associated with rising sea levels. However, the point will eventually be reached when continuing to increase the height of shoreline protection will no longer be feasible. Development

will be forced to pull back from the waters edge and allow salt marshes to recede. Non-structural measures would allow this landward shift in wetlands to proceed naturally, as development could be pulled back at a gradual pace to keep up with rising sea level. Implementing structural protection measures, however, would not only postpone the inevitable evacuation of coastal areas subject to sea level rise, they could make matters worse by supporting continued development within the coastal floodplain.

Corps Response 24:

Even with accelerated sea level rise, the shorefront is most likely to be raised to keep pace with rising tides. A relatively low investment to raise the shorefront compared to protecting the billions of dollars already invested in the floodplain would dictate continued protection of the highly developed industrial, commercial and residential floodplain and major arteries and utilities serving the area and Boston's North Shore.

25. F&W Comments: Given the potential for widespread impacts to the Saugus-Pines River estuary from project-induced changes in tidal flushing, we believe that large scale mitigation/enhancement measures are justified. The Corps should seriously consider breaching and or complete removal of the I-95 fill embankment to restore tidal flushing to degraded portions of the estuary. Breaching the fill embankment is mentioned throughout the Hydrology and Hydraulics Appendix as a way to mitigate estuary flushing impacts associated with the project. Providing measures to restore and enhance estuarine habitat is consistent with the stated plan formulation considerations, as well as the provisions of the Fish and Wildlife Coordination Act, the Cooperative Agreement on Waterfowl Conservation at Civil Works Projects, the "Estuary Protection Act", Executive Orders 11990 and 11988, and the Coastal Zone Management Act.

Corps Response 25:

The project would have no significant impact on tidal flushing (reduction of less than 0.1%). Total breaching of the I-95 fill would exacerbate flooding in East Saugus; is not a most likely future condition; and is not a recommendation of the report. The proposed mitigation is adequate to compensate impacts and is in accordance with Corps policy and guidelines.

The I-95 Embankment Group was formed by the Executive Office of Environmental Affairs to coordinate the disposition of the embankment and development of a master plan. The Group includes CZM, DEQE, EPA, MEPA, MDC, DFW, EOTC, DCPO and the Corps. Much of the I-95 embankment is in the process of being turned over to the MDC who is responsible for preparing the master plan. MDC views the priorities for the embankment to include development of a park and to maintain its existing flood reduction potential. The group recognized the importance of not breaching the fill (i.e.; not making holes through it or total removal) due to the flooding problems this would cause in East Saugus. The state led group has the responsibility for the final solution of the I-95 embankment.

26. F&W Comments: In summary, we are unable to support the preferred alternative of a floodgate and associated shoreline protection because of unacceptable local impacts from certain structural features of the project, as well as the potential for long-term impacts to the ecology of the Saugus-Pines River estuary. Although we have recommended measures to avoid or otherwise mitigate impacts from the Lynn Harbor dikes and floodgate itself, we do not see any way to avoid long-term estuary impacts from tidal changes associated with project operation. While project-induced tidal changes may not be significant at the present time, future changes in environmental or social/political conditions could result in significant fish and wildlife impacts from increased frequency and duration of floodgate closures.

Corps Response 26:

NED has assessed all project related impacts and feels the proposed project is in the public interest and adequate mitigation opportunities exist to minimize project impacts. Long term impacts to the estuary under a worst case 4.2 foot sea level rise would be evaluated during project operations.

27. F&W Comments: A scaled-down version of the local protection option may prove to be less environmentally damaging in the long run than the floodgate option. However, this would be contingent on the Corps' ability to either relocate proposed levees or replace them with vertical walls to avoid the wetland and intertidal encroachment of the current proposal. Implementation of either of the proposed structural alternatives would have adverse implications regarding the need to gradually pull back development from coastal areas subject to reclamation by accelerated sea level rise.

Corps Response 27: Option 3 provides the maximum net economic benefits, while having lower ecological impact than the other structural alternative (Option 1). Option 2 (non-structural) does not meet Corps policy of implementing those projects, consistent with pertinent environmental regulations, that provide the maximum net economic benefits. Option 3 is widely supported due to the regional and high level of protection provided. Option 1 lacks support due to its limited geographic protection and high environmental, social and aesthetic impacts. Option 2 lacks support due to its very limited area of protection. Also, with sea level rise it is highly unlikely the developed floodplain would be abandoned.

28. F&W Comments: We consider the project to be inconsistent with the current Federal philosophy and public policy to avoid development in estuaries, coastal areas susceptible to flooding, floodplains and wetlands. This philosophy and policy is laid out in a number of Federal laws, executive orders, and regulations. The "Estuary Protection Act" established a National policy to protect, conserve, and restore estuaries in the United States. The Coastal Zone Management Act established a national policy to preserve, protect, and where possible to restore or enhance the resources of the Nation's coastal zone. The Coastal Barriers Resources Act recognizes the importance of coastal barrier resources and seeks to eliminate Federally subsidized development in flood-prone coastal

barrier areas. Executive Orders 11988, Floodplain Management, and 11990, Protection of Wetlands, recognize the many beneficial values of floodplains and wetlands and require that Federal agencies avoid direct or indirect support of floodplain or wetland development wherever there is a practicable alternative.

Corps Response 28: The project is consistent with Federal laws and guidelines and has undergone extensive public coordination and formulation to eliminate or reduce environmental impacts. The project also provides the opportunity to further protect the valuable resources in the estuary, not otherwise afforded without the project. These measures were specifically requested by those local, state and Federal agencies charged with protection of the wetlands. No induced development in the wetlands or floodplain is expected as a result of project implementation.

29. F&W Comments: We support the use of non-structural solutions to reduce flood damages in the study area since they would not adversely impact fish and wildlife resources nor would they have the wide-ranging ecological implications of the regional floodgate alternative. We encourage the Corps to further investigate the potential for all possible non-structural flood control solutions, perhaps in combination with scaled-down or otherwise modified structural features that would not impact the important fish and wildlife resources of the project area.

Corps Response 29: Protection of the region against coastal flooding, threatening life and property, can not effectively be accomplished with the non-structural plan.

ATTACHMENT F

REAL ESTATE APPENDIX F, REVISED

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

SAUGUS RIVER AND TRIBUTARIES
FLOOD DAMAGE REDUCTION STUDY
LYNN, MALDEN, REVERE AND
SAUGUS, MASSACHUSETTS

REAL ESTATE
APPENDIX F

REVISED
PRELIMINARY ESTIMATE
OF
REAL ESTATE COSTS

OCTOBER 1989

PREPARED BY:


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Review Appraiser

REVIEWED
&
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PURPOSE

The purpose of this report is to estimate the Preliminary Real Estate costs associated with flood protection regarding SENE studies for implementation of a regional floodgate located at the mouth of the Saugus River in the cities of Revere and Lynn Massachusetts.

INSPECTION OF THE REAL ESTATE

The properties within the study areas were viewed and traversed in the field during the summer and fall of 1989.

LOCATION

The subject area is located in the Northeasterly section of Massachusetts, in the communities of Revere and Lynn, within the Counties of Suffolk and Essex.

SCOPE

The proposed floodgate will be located across the Saugus River, tying into the respective lands that lie adjacent to the river. Along with the floodgate structure, dikes with stone protection along the inboard side of the existing bulkhead which lies along Lynn Harbor will be necessary as well as, a combination of rock revetments and walls along Rice Avenue up to and including Carey Circle. In addition to these areas the M.D.C.Park Dikey, located along Revere Beach Boulevard, a tide gate at Sales Creek and approximately 6.5± acres of tidal marsh for mitigation purposes will also be required.

Only the selected alignment #2, will be addressed in this report.

By implementing this regional plan (a floodgate) areas of four communities, Revere, Lynn, Saugus and a very small portion of Malden will be protected from damages caused by a Northeaster type storm.

This report relates to the SPN (Standard Project Northeaster) which necessitates acquisition of permanent and temporary easement interests for purposes of construction and maintenance of a tidal barrier, dikes, concrete gravity and I-walls, and stone protection.

Another aspect of the proposed project is the protection of the Estuary which will be used as a ponding or storage area during periods when the floodgates are closed. Present local ordinances and state statutes are adequate to protect the integrity of the estuary. Because of these governing regulations we have not included the cost of acquisition in the selected plan. This preliminary estimate is for informational purposes only and is found on page F-15.

DESCRIPTION OF PROJECT AREA

City of Revere

The City of Revere is located on the Massachusetts coast about two miles northeast of the City of Boston. About one-fifth of the area is a salt marsh adjacent to the Pines River Estuary, and about one-third of the city, including the marsh area, is below elevation 10 feet, mean sea level. The remainder of the city is gently rolling with a few steep hills, the highest elevation being at the reservoir on Fenno's Hill at about 192 feet above mean sea level. Most of the land above 10 feet mean sea level is fully developed. Any future development would be at the expense of existing uses. The population of the city is about 43,000, and on peak summer days more than 20,000 people visit the 3-1/2 miles of Revere Beach for recreational purposes.

City of Lynn

City of Lynn is located in Essex County in the eastern section of Massachusetts on the northern shore of Massachusetts Bay, bordered by Saugus and Lynnfield on the west, Saugus River on the southwest, Peabody and Salem on the north, Swampscott and the Atlantic Ocean on the east and Nahant and Revere on the south. It is 11 miles from Boston. The population is about 79,000 in an area of approximately 11.21 square miles. During the 1970-1980 decade, the population decreased by 11,823 or 13.1%. The city was industrial early in its history with the first iron smelting plant in America being established there in 1643. Also, it was a famous shoe city. Today, Lynn is a diversified industrial center.

Rail and bus facilities are available in Lynn. The Mass. Bay Transportation Authority assures this area of adequate mass transportation. The Boston and Maine Railroad serves this area. The public roads and highways are in good condition; the principal highways serving the Lynn area are state Rts. 107 and 129. Logan International Airport is about 10 miles away.

Town of Saugus

Saugus is a town of 25,000 persons; it serves as the gateway to Boston's North Shore and is 10 miles from Boston. It is bordered on the south by Revere, southeast by the Atlantic Ocean, Melrose and Wakefield on the southwest, Lynnfield on the northwest and Lynn on the north.

Saugus was originally a farming community; it then changed to industry and manufacturing and today it is mostly residential. Saugus has an area of 10.5 square miles, and it has excellent schools. There are churches of all denominations in the town and large and small shopping centers.

State Rts. 129, C-1, and 107 enter and serve the town, as well as U.S. Rt. 1. Bus service is provided by the Massachusetts Bay Transportation Authority and Greyhound Bus Company. The Boston and Maine Railroad services the town; and Logan International Airport and the Port of Boston are 8 miles away.

DESCRIPTION OF PROJECT AREAS AND ALIGNMENT

The areas which comprise the Floodgate Plan include the Floodgate Area, (Saugus River) Lynn Harbor, Point of Pines, M.D.C. Park Dike, Mitigation area and Tide Gate at Sales Creek.

There follows a description of each area.

FLOODGATE AREA

SELECTED ALIGNMENT 2

Alignment two commences at the bulkhead on the Lynn side of the Saugus River about 700 feet easterly of the General Edwards Bridge, traverses in a generally southerly direction for approximately 1,310 feet terminating along side of the existing pump house and adjacent to Bateman Avenue in the City of Revere.

The termination of the floodgate alignment is also a transition point for the Point of Pines alignment, Reach "F".

POINT OF PINES AREA

Reach "A" would commence on the westerly side of Carey Circle and would traverse in an easterly direction a distance of about 230 feet ending at Reach "B". A stone revetment at elevation 13.2 feet would be constructed throughout this reach.

Reach "B" commences at Reach "A's" termination and would continue to traverse in an easterly direction for a distance of about 1320 feet including Reaches "C" and "D" as well. A stone revetment at elevation 16.0 and 14.5 (D) feet would be constructed throughout these Reaches. Upon joining Reach "E" there is an area of transition from stone revetment to a combination of stone revetment and sand dune, which continues in an easterly direction to Reach "F" a distance of about 1600 feet.

Reach "F" commences at the concrete wall at the easterly end of Rice Avenue and runs about 240 feet in a northerly direction, thence turns and runs in a generally westerly direction along three courses, 200, 260 and 500 feet respectively, terminating at the floodgate. The alignment will increase the height of the existing wall to elevation 15.0 feet.

LYNN HARBOR AREA

REACH "B"

Reach "B" commences at the dog-leg of the existing bulkhead and runs in a general northeasterly direction a distance of approximately 1,800 feet to a point where it intersects with Reach "C". The proposed construction of a dike with stone protection throughout this reach will be to elevation 17.0 feet.

The dike will have a starting point at the existing bulkhead and will extend about 80 feet inland, encompassing about 3.31± acres of privately owned lands.

REACH "C"

Reach "C" commences at Reaches "B" terminus and runs in a general northeasterly direction a distance of approximately 1,500 feet to a point where it intersects with Reach "D".

The proposed construction of a dike with stone protection throughout this reach will be to elevation 15.0 feet.

The dike will have a starting point at the existing bulkhead and will extend about 70 feet inland, encompassing about 2.41± acres of privately owned lands.

REACH "D"

Reach "D" is divided into four sections and is comprised of approximately 3,125 linear feet. "D1" commences at the intersection of Reach "C", follows the same direction for an approximate distance of 1,065 feet to the corner of the bulkhead of Bay Marine where "D2" commences and runs along the following northwesterly and southerly directions for 280, 30, 10, 30, and 370 feet respectively, terminating at the corner of the bulkhead of Boston Gas Company where "D3" intersects. "D3" follows the same alignment as the existing wall of Boston Gas for an approximate distance of 630 feet where it intersects with "D4". Then "D4" turns and runs along the following courses, northerly 160 feet and northwesterly 110 feet to the boat ramp and parking area where a 40 foot gate will have to be installed; then along Lynn Harbor Marine for a distance of 150 feet, thence turning and running in a northeasterly direction for approximately 160 feet, thence turns and runs in a northwesterly direction approximately 130 feet where it intersects with Reach "E".

REACH "E"

Reach "E" traverses in a northeasterly direction for approximately 1,100 feet where it intersects with Reach "F".

A "T"-wall is proposed for this reach and will be constructed in the location of the existing concrete and rubble stone mound, to elevation 14.0 feet.

REACH "F"

Reach "F" commences at Reach "E" terminus turning and running in a northwesterly direction for approximately 300 feet, thence northeasterly along two courses of 300 and 380 feet respectively, thence turns and runs in a northerly direction approximately 220 feet terminating at the Heritage Park retaining wall.

M.D.C. PARK DIKE & WALL

The M.D.C. Park Dike contains approximately 8.50± acres which is all of the land between Beach and Revere Streets and between Ocean Avenue and Revere Beach Boulevard, except for a block of land at the Beach Street end and that area where the M.D.C. Police Station is situated. A Dike is proposed for this area and will encompass approximately 6.28± acres.

TIDAL GATE SALES CREEK

A Tidal Gate adjacent to the intersection of Revere Beach Parkway and North Shore Road and in Sales Creek is required and will require about .023 acres of abutting lands for access and maintenance purposes.

6.5+ ACRE CLAM FLAT MITIGATION AREA

Due to project impacts on shellfish resources, a mitigation area located at the I-95 embankment, adjacent to the Northgate shopping plaza, containing approximately 8.5± acres of which 2.0± acres will be used for temporary stockpiling of the salty sand material removed from between elevation 5.0 and -6.0.

GOVERNMENT OWNED FACILITIES

Section III of the Act of Congress approved 8 July 1958, (PL 85-500) authorized the protection, realteration, reconstruction, relocation or replacement of municipally-owned facilities. A preliminary inspection of the project areas indicated no Government owned facilities would be affected.

RIGHTS TO BE ACQUIRED

Local interests will be required to provide all lands, easements and rights-of-way necessary for project purposes.

FEE AREA

There are no known areas requiring fee acquisition at this time. However, if the parking area presently, located in Lynn and adjacent to the General Edwards Bridge, under easement to the M.D.C. (Metropolitan District Commission) and used in conjunction with the fishing pier is terminated, then fee acquisition of a one acre parcel would be necessary.

PERMANENT EASEMENT AREAS

Permanent easements for construction and maintenance purposes are necessary. Preliminary investigations indicate that after the imposition of the permanent easement interest, the highest and best use of the remainders of the properties will not be materially affected. However, it is historically known that the mere knowledge and existence of the imposition infers a restrictive aspect. Therefore, the cost to acquire the permanent easement interest would be equivalent to the underlying fee value since those uses would be for project purposes. The only exceptions to this would be where there are existing structures which were built without benefit of any real estate interest or there is a requirement due to local zoning or state policy/statue. These areas will be discussed in detail at the end of this section.

Lands required for project purposes would still remain in their private ownerships to maintain conformity of their existing lot areas. The estimated costs for the permanent easement rights are predicated on the assumption that construction methods will be of the excavation and placement methods and would not adversely affect surface or near-surface improvements. If it is determined and found that selected methods of construction would cause damage to surface or near-surface improvements, then the estimated costs for easement rights would not remain valid and a new in-depth real estate study of the proposed taking would be required.

EXCEPTED AREAS

The areas that were previously referred to as exceptions, regarding there value as not being equivalent to the underlying fee value, are as follows:

POINT OF PINES - REACHES "E"&"F"

Area one lies within the Point of Pines alignment Reaches "E" and "F" where there is an existing seawall which will be replaced with a "T"- wall. The wall is located on property of the Point of Pines Association and was constructed under a release from damages document(s) but was never recorded for easement usage. Because the area is required for project purposes, the measure of compensation will be based on the area required which would be greater than the area that was previously encumbered by others.

LYNN HARBOR - REACHES "B" & "C"

Area two lies within the Lynn Harbor alignment Reaches "B" and "C". Both of these reaches require construction of dikes with stone protection which must be built inboard of the existing bulkhead structure, as both local planning and zoning boards and state agencies will not allow any structures within the tidal flats. The restriction also applies to individual owners as well.

Development of any lands in this area must follow requirements for building within a 100-year flood plain. Because of the flood plain requirements a developer must have a first floor elevation above 12.0 feet. With existing elevations at less than 11.0 a developer/builder would have only a few options such as filling the entire area, raising the first floor elevations or building a dike with stone protection. The most feasible option would be the dike with stone protection. This option would provide the most protection, within the flood plain.

A preliminary plan by a former developer for reach "B", addressed this type of dike as one of his proposed options. Had this plan been formally submitted to the city it would have in all probability been approved, according to local officials.

Under this assumption and having reviewed the plans for the proposed project, it is considered that the measure of compensation for both Reaches "B" and "C" would be nominal for the permanent easement interest. This opinion is based on several factors, the easement is required for maintenance and inspection which could be accomplished by using the top of dike rather than seeking additional areas inboard of the inland toe of the dike. In the event the project is not built a developer would still be required to build and maintain this or a similar type structure, the project will not encumber any more lands than would be required by a private developer and lastly if the project is built prior to a private developer doing so, the area would meet flood plain requirements thereby removing this burden and preparing for future development.

For the most part and at the present time the proposed project has been coordinated with the owners/developers so that maximum use of the lands could be realized. This will continue right through the life of the project and if changes to plans or any existing or new regulations affect any lands which may require adjustment then revisions to the real estate estimates will be made.

LYNN HARBOR - REACH "F"

Area three comprises Reach "F" and the same rational applies here as aforementioned except, that a gravity wall will be constructed and will follow the shoreline/bulkhead alignment.

M.D.C. PARK DIKE

The M.D.C. Park Dike requires a permanent easement interest for a flood control dike only. The dike would be constructed inboard of the existing sidewalk, would run a distance of about 80 feet and encompass about 6.28± acres of the subjects 8.54± acres. These lands are earmarked for future recreation and parkland uses as described in the approved MDC Master Plan.

The dike would interrupt the approved master plans development by leaving about 2.36± acres of low rear lands. Because of this interruption, of an approved plan, it is considered that the proposed project would cause damages due to a reduction of the utility of the lands. Granted, local zoning regulations do not specify any minimum lot areas for recreational development but the location of the remaining lands would interrupt both the intended and approved uses.

There follows a breakdown of the permanent easement estimate by the respective area.

	<u>ACRES</u>	<u>ESTIMATED VALUE</u>
Lynn Harbor	6.250	\$ 8,000 (Nominal)
Point of Pines	4.000	\$ 6,000
Access	.152	\$ 2,000
MDC Park Dike	6.280	\$ 62,500
Parking Area	1.079	\$ 705,000
Sales Creek	.023	\$ 500
Mitigation Area	6.500	\$ 13,000
	-----	-----
	26.280	\$ 797,000

TEMPORARY EASEMENTS

Temporary easements 35 to 50 feet wide, on either side of dikes, walls, barrier and all other areas requiring construction or excavation are necessary, where available, during the construction period as well as staging areas adjacent to the work site(s), such as a one acre site on the Lynn side adjacent to the General Edwards Bridge and alongside the bulkhead.

The estimated values are based on comparable market data and reflect a fair rate of return for the use of the owners land for about one year, at 15% per annum. Actual estimates will be reflected in appraisals and may be higher or lower due to market and economic conditions or trends in the area at that time.

There follows a breakdown of the permanent easement estimate by the respective area.

	<u>ACRES</u>	<u>ESTIMATED VALUE</u>
Lynn Harbor	9.730	\$ 6,624,400
Point of Pines	4.940	\$ 5,000
Barrier	.500	\$ 326,700
MDC Park Dike	4.000	\$ 40,000
Parking Area	-0-	\$ -0-
Sales Creek	.500	\$ 500
Mitigation Area	2.000	\$ 4,000
	-----	-----
	21.670	\$ 7,000,600
Fair rate of return for one year		x15%

		\$ 1,050,090

CALL		\$ 1,050,000

ACQUISITION COSTS

Acquisition costs will include costs for mapping, surveying, legal descriptions, title evidence, negotiations, closing and administrative costs for possible condemnations. The acquisition costs are based upon this office's experience in similar civil works projects in the general area and are estimated at \$6,000.00 per ownership including the cost of appraisals.

RELOCATION ASSISTANCE COSTS

Public Law 91-646, Uniform Relocations Assistance Act of 1970, provided for uniform and equitable treatment of persons displaced from their homes, businesses, or farms by a Federally Assisted Program. It also established uniform and equitable land acquisitions policies for these projects. Included among the items under PL 91-646 are the following:

- a. Moving Expenses
- b. Relocation Allowance (Business)
- c. Replacement Housing (Homeowners)

- d. Replacement Housing (Tenants)
- e. Relocation Advisory Services
- f. Recording Fees
- g. Transfer Taxes
- h. Mortgage Prepayment Costs
- i. Real Estate Tax Refunds (Pro-Rata)

Preliminary investigations indicate that none of the ownerships will require relocation assistance at this time. Should the existing preliminary taking lines be changed to include improvements, then the taking authority must certify that there will be available, in areas generally not less desirable and at rents/prices within the financial means of those that would be displaced, decent, safe and sanitary facilities, equal in number to the number of, and available to, such displaced persons who require such dwellings and reasonably accessible to their places of employment.

The ownerships affected by the permanent easement interests vary according to the plan and are reflected in the recapitulation of real estate costs. Therefore, an estimate of \$ 200.00 per ownership is carried for planning purposes and is limited to expenses incidental to the transfer of real estate interests.

SEVERANCE DAMAGES

Severance damages usually occur when partial takings are acquired which restrict the remaining portion from full economic development. The severance damages are measured and estimated on the basis of a "Before" and "After" appraisal method and will reflect actual value loss incurred to the remainder as a result of partial acquisition. Detailed appraisals will reflect these losses. At this time, the only known area where severance damages will occur is at the M.D.C. Park Dike where approximately 6.28± acres of the subjects 8.54± acres will be required for project purposes, thus leaving about 2.36± acres of lands considered to be rear lands without much utility remaining. The cost for this is estimated at \$22,500.

PROTECTION AND ENHANCEMENT OF CULTURAL ENVIRONMENT

In accordance with instruction set forth in Teletype DA (DAEN) R 191306A, dated October 1971, Subject: "E011593, 13 May 1971, Protection and Enhancement of Cultural Environment"; a study has been made in the subject areas. The study revealed that no local, State, Federally owned nor Federally controlled property of historical significance would fall within the provisions of E011593.

CONTINGENCIES

A contingency allowance of 25 percent is considered to be reasonably adequate to provide for possible appreciation of property values from the time of this estimate to the acquisition date, for possible minor property line adjustments or for additional hidden ownerships which may be developed by refinement to taking lines, for adverse condemnation awards and to allow for practical and realistic negotiations.

WATER RIGHTS

Lands that would be acquired for project purposes may affect riparian interests. Upon refinement of all alignments, an in-depth study of the ownerships affected would be conducted to determine any damage resulting from the proposed acquisition. However, actual damages would be reflected in the acquisition appraisals.

ZONING

The lands affected by the proposed project are zoned for residential, commercial, industrial, and wetlands within the respective zoning district.

HIGHEST AND BEST USE

The highest and best use of the affected properties is considered, in most cases, to be their present use.

EVALUATION AND CONCLUSION

The areas of study are based upon preliminary Engineering Division and assessors plans.

All alignments for dikes, walls, excavation and any other components which make up the various elements of the proposed project, regarding real estate interests are subject to refinement prior to any proposed construction.

The values of lands and improvements within the study areas have been estimated by the market data or comparable sales approach. Local assessors, real estate brokers, appraisers and other knowledgeable persons were contacted to secure data during the valuation process. Numerous sales were analyzed and the upper value for each category of land and improvements were used in the final estimate(s) of value. (Primary unit values used were \$1,500 per acre marsh/wetlands and \$15 per square foot in the commercial area.)

There is no easy or simple way in which real estate sales can be mathematically reduced to a simple value indicator. Each transaction involves not only individual needs, wishes and wants of a particular buyer or seller at the time of sale but the properties themselves vary widely as to size, shape, frontage, exposure, location access, soil conditions and topography. The best common denominator of the price per square foot and/or the price per acre was used with a full understanding that these unit values may be the best index but by no means can they reflect all problems for a given parcel, area, lot or community.

On the following page is a recapitulation of real estate costs.

RECAPITULATION OF REAL ESTATE COSTS

SELECTED ALIGNMENT 2
INCLUDES LYNN HARBOR, POINT OF PINES, M.D.C.
PARK DIKE, SALES CREEK TIDAL GATE,
6.50± ACRE MITIGATION AREA AND 1 ACRE PARKING AREA

	<u>Rounded to closest \$1,000</u>
Permanent Easements	
Private & Public Ownership	
29.26± acres	\$ 797,000
Temporary Easements	
Private & Public Ownership	
24.67± acres	\$ <u>1,050,000</u>
Total Permanent & Temporary Easement Costs	\$ 1,847,000
Contingency- 25% of above	\$ <u>461,750</u>
Total Estimated Easement Costs	\$ 2,308,750
Severance Damages - 2.36± acres	22,500
Relocation Assistance Costs	
15 Private & Public Ownerships @ \$200	\$ 3,000
Acquisition Costs	
15 Private & Public Ownerships @ \$6,000	\$ <u>90,000</u>
Total Estimated Real Estate Costs	\$ 2,424,250
Call	\$ 2,400,000

ADDENDA

ESTUARY (SALT MARSH) ACQUISITION

Permanent Easements or Fee		
Private & Public Ownership		
1650± acres	\$ 2,475,000	
Contingency- 25% of above	\$ 618,750	
Total Estimated Easement or Fee Costs		\$ 3,093,750
Relocation Assistance Costs		
360 Private & Public Ownerships @ \$200		\$ 72,000
Acquisition Costs		
360 Private & Public Ownerships @ \$6,000		\$ 2,160,000
Total Estimated Real Estate Costs		\$ 5,325,750
Call		\$ 5,326,000

NOTE:

The above estimate is for reference purposes only, as previously stated on page F-2, and is not included in the estimate of real estate costs on page F-14.

No in depth study, as far as value is concerned, was undertaken, nor was an estimate for survey considered due to this being a desk type estimate.

ALTERNATIVES

LYNN HARBOR ALIGNMENT

ALTERNATIVE "A" - "T"-WALL

REACH "B"

In lieu of constructing a dike with stone protection along the inboard side of the bulkhead, a "T"-wall in Reach "B" would be a viable alternative. The alignment would commence at the dog leg of the bulkhead and would run in a northerly direction a distance of about 400 feet, thence turns and runs in a northeasterly direction, following the limits of the property line, some 920 feet to Hanson Street where a ramp would be built to span the width of Hanson Street. From the northerly side of Hanson Street the wall would continue until its terminus in high ground a distance of about 470 feet.

The area encumbered would be 25 feet in width and would extend a distance of about 1,790 feet and contain about 1.03± acres.

REACH "C"

A similar alignment in Reach "C" would commence at the high ground of lands occupied by the sewage treatment plant and would run in a northeasterly direction a distance of about 270 feet to a ramp in Riley Way. The alignment then continues from the northerly side of Riley way running in a southerly direction, along the way, to its terminus at the bulkhead a distance of about 250 feet.

The area encumbered would be 25 feet in width and would extend a distance of about 520 feet and contain about .30± acres.

An estimated cost of \$ 724,000 for both Reaches "B" and "C" including permanent and temporary easements and contingencies is carried for planning purposes.

REACH "F"

Reach "F" would also require a T-Wall which would commence at Reaches "E" terminus turning and running in a northwesterly direction for approximately 300 feet, thence northeasterly along two courses of 300 and 380 feet respectively, thence turns and runs in a northerly direction approximately 220 feet terminating at the Heritage Park retaining wall.

The area encumbered would be 15 feet in width and would extend a distance of about 1,200 feet and contain about .28± acres, at an estimated cost of \$140,000, including permanent and temporary easements and contingencies is carried for planning purposes.

ALTERNATIVE "B" - DIKE

Alternative "B" would follow the same alignment as described in Alternative "A" but would require construction of a dike being 50 feet wide in total, for Reaches "B" and "C" only. Real estate interests would then be \$ 2,500,000 including permanent and temporary easements and contingencies is carried for planning purposes.

ATTACHMENT G

OTHER CORRESPONDENCE

OTHER CORRESPONDENCE

- G 1. Corps transmittal of Draft Report to EOEA, 14 June 89
- G 2. Corps transmittal of Draft Report to EPA, 14 June 89
- G 3. Corps transmittal of Draft Report to Public, 16 June 89
- G 4. Corps transmittal of Draft Report to MDC and Congressional Delegation, 16 June 89
- G 5. Engineers Recommend Floodgate Plan for Saugus River, 16 June 89
- G 6. Army Engineers Unveil Plan to Relieve Flooding Problems, 21 Jun 89
- G 7. Giant Lynn-Revere Seawall Proposed, 21 June 89
- G 8. Notice of Draft EIS/EIR in Federal Register (23 Jun 89) and Environmental Monitor (26 Jun 89)
- G 9. U.S. Army Corps of Engineers Schedule Workshop, 26 Jun 89
- G10. Corps Letter on Technical Group Meeting, 27 Jun 89
- G11. Corps Letter on Citizen Steering Committee Meeting, 29 Jun 89
- G12. Engineers Schedule Workshop on No. Shore Flood Control Project, 12 Jul 89
- G13. Army Corps of Engineers Seeks Input on Flood-Control Proposals, 24 Jul 89
- G14. Stephen L. Smith, Lynn Planning Board, 1 Aug 89
- G15. John R. Arrigo, Revere City Council, 3 Aug 89
- G16. Corps Letter to Mr. Thomas P. Kavanaugh, 9 Aug 89
- G17. Corps Letter to Commissioner Ilyas Bhatti, MDC, 14 Aug 89
- G18. Corps Reply to Mr. Douglas G. Marshall, NEFMC, 30 Oct 89



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

June 14, 1989

Planning Division
Impact Analysis Branch

Mr. John DeVillars
Secretary
EOEA
100 Cambridge Street - 20th floor
Boston, MA 02202
Attention: MEPA Unit: File No. 6497

Dear Mr. Secretary:

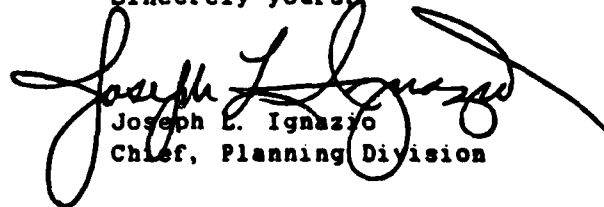
Attached please find three copies of the Draft Study Report and EIS/EIR plus appendices for the Saugus River and Tributaries, Flood Damage Reduction Study, Lynn, Malden, Revere and Saugus, Massachusetts.

The deadline date for receipt of comments on the EIR will be the same as for the EIS which is expected to be August 7, 1989, about two weeks more than the minimum 30 day EIR review period, based on publication in the June 24, 1989 Monitor. We are suggesting that commentators provide comments to us, with a copy to your office, to cover the two processes.

I appreciate the willingness of your office to endorse the development of a single document for both State and Federal review. I trust that you will be pleased with the result.

If you have any questions, please call me at (617) 647-8508, or Dr. Joseph Horowitz, my Environmental Manager for the study, at 647-8518. The Project Manager is Mr. Robert G. Hunt. He can be reached at 647-8216.

Sincerely yours,


Joseph L. Ignazio
Chief, Planning Division



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

June 14, 1989

REPLY TO
ATTENTION OF

Planning Division
Impact Analysis Branch

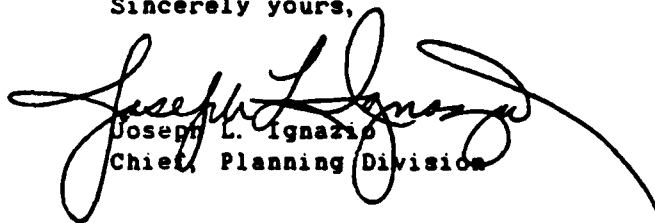
Director
Office of Federal Activities (A-104)
Environmental Protection Agency
Attn: Ms. Marilyn Henderson
Room 2119 Waterside Mall
401 M Street, S.W.
Washington, D.C. 20460

Dear Ms. Henderson:

Attached please find five copies of the Draft Study Report and EIS plus appendices for the Saugus River and Tributaries, Flood Damage Reduction Study, Lynn, Malden, Revere and Saugus, Massachusetts (in the Counties of Essex, Middlesex, and Suffolk). Transmittal of the documents to our mailing list will be completed by close of business, Friday, June 16, 1989.

I am the official responsible for both the distribution and contents of the EIS. If you have any questions, please call me at 617-647-8508, or Dr. Joseph Horowitz, my Environmental Manager for the study, at 647-8518. The Project Manager is Mr. Robert G. Hunt. He can be reached at 647-8216.

Sincerely yours,


Joseph L. Ignazio
Chief, Planning Division



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

June 16, 1989

Planning Division
Basin Management Branch

DEAR INTERESTED PARTY:

The New England Division, Corps of Engineers is providing, for your comments, the enclosed Draft Report entitled Water Resources Investigation-Feasibility Report and Draft Environmental Impact Statement and Environmental Impact Report, Saugus River and Tributaries, Flood Damage Reduction Study, Lynn, Malden, Revere and Saugus, Massachusetts. The Corps is pleased to provide the report on behalf of the state sponsor, the Metropolitan District Commission, and the sponsoring Communities of Lynn, Malden, Revere and Saugus, Massachusetts.

The report culminates three and one half years of investigating the coastal flooding problems and resources in the communities, and selects for implementation a Regional Plan. The plan would provide a very high degree of coastal flood protection to 5000 residential, commercial and industrial buildings in these communities, reduce damages to major north shore utilities, and reduce disruption of regional public transportation. The plan also includes park land for public recreation and provides for a safer port of refuge for the 400 vessel fleet using the waterways. Protection of the natural flood water storage area in the Saugus and Pines Rivers estuary is also a feature of the plan which would help preserve it's valuable environmental resources.

Your comments on the report and the selected plan must be received during the 45 day review period. The official closing date is 45 days from the date on which the Notice of Availability for the Environmental Impact Statement appears in the Federal Register. With the Notice expected to be published on June 23, the closing date is expected to be August 7, 1989.

Your comments should be sent to:

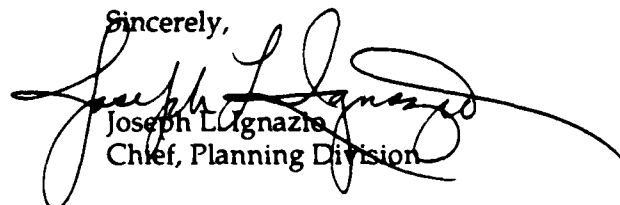
Colonel Daniel M. Wilson, Division Engineer
U.S. Army Engineer Division, New England
424 Trapelo Road
Waltham, Massachusetts 02254-9149

A copy of your comments should
be provided for the
MEPA review process to:

Mr. David Shepardson
EOEA/MEPA Unit
100 Cambridge Street, 20th floor
Boston, Massachusetts 02202
Reference: EOEA File Number 6497
Telephone 617-727-5830

The sponsors and the Corps appreciate your interest in this study. If you have any questions, please feel free to call me at (617) 647-8508, the Project Manager, Mr. Robert G. Hunt (647-8216), or the Project Environmental Manager, Dr. Joseph L. Horowitz (647-8518).

Sincerely,


Joseph L. Ignazio
Chief, Planning Division

Enclosure



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

June 16, 1989

REPLY TO
ATTENTION OF
Planning Division
Basin Management Branch

Mr. Ilyas Bhatti, Commissioner
Metropolitan District Commission
20 Somerset Street
Boston, Massachusetts 02108

Dear Mr. Bhatti:

In the temporary absence of Colonel Daniel M. Wilson, I am pleased to provide for your comments, the enclosed Draft Report entitled Water Resources Investigation-Feasibility Report and Draft Environmental Impact Statement and Environmental Impact Report, Saugus River and Tributaries, Flood Damage Reduction Study, Lynn, Malden, Revere and Saugus, Massachusetts. The report has been sent out for public review on your behalf as the state sponsor and the sponsoring communities of Lynn, Malden, Revere and Saugus, Massachusetts.

The report culminates three and one half years of investigating the coastal flooding problems and resources in the communities, and selects for implementation a Regional Plan. The plan would provide a very high degree of coastal flood protection to 5000 residential, commercial and industrial buildings in these communities, reduce damages to major north shore utilities, and reduce disruption to regional public transportation. The plan also includes parkland for public recreation and provides for a safer port of refuge for the 400 vessel fleet using the waterways. Protection of the natural flood water storage area in the Saugus and Pines Rivers estuary is also a feature of the plan which would help preserve its valuable environmental resources.

I would appreciate any comments you have on the report and the selected plan. Also needed is a Letter of Intent that the Commonwealth would meet the items of local cooperation summarized in the main report. Meetings will be arranged with you and your staff in the near future to discuss the report, the Letter of Intent, and a draft Local Cooperation Agreement. Comments should be received during the 45 day public review period. The official closing date is 45 days from the date on which the Notice of Availability for the Environmental Impact Statement appears in the Federal Register. With the Notice expected to be published on June 23, the closing date is expected to be August 7, 1989. As part of the Massachusetts environmental review process, I would also appreciate copies of your comments sent to: Mr. David Shepardson, EOE/MEPA Unit, 100 Cambridge Street, 20th Floor, Boston, Massachusetts 02202, (Reference: EOE File Number 6497).

-2-

I appreciate your interest and help in this study. If you or your staff have any questions regarding this report, please feel free to call me at (617) 647-8222, or the Project Manager, Mr. Robert G. Hunt (647-8216).

Sincerely,



Stanley J. Murphy
Lt. Colonel, Corps of Engineers
Acting Division Engineer

Enclosure

NOTE: Similar Letter Provided to:

Honorable Edward M. Kennedy, United States Senator
Honorable John F. Kerry, United States Senator
Honorable Edward J. Markey, Representative in Congress
Honorable Nicholas Mavroules, Representative in Congress



US Army Corps
of Engineers
New England Division

News Release

Release No. 89-292 Contact: Sue Douglas

For Release: Upon Receipt Phone: 617-647-8264

424 Trapelo Road, Waltham, MA. 02254-9149

June 16, 1989



ENVIRONMENT



FLOOD CONTROL



MILITARY
CONSTRUCTION



NAVIGATION



RECREATION



RIVER SYSTEMS



SHORE
PROTECTION

ENGINEERS RECOMMEND FLOODGATE PLAN FOR SAUGUS RIVER

WALTHAM, Mass. — Coastal flood damage reduction in the Saugus and Pines rivers and Broad Sound areas of Lynn, Malden, Revere and Saugus can best be achieved by implementation of a regional floodgate plan. This finding stems from a 3-1/2 year, \$2.5 million study recently completed by the U.S. Army Corps of Engineers.

"The regional floodgate plan provides a very high level of coastal flood protection, yields the highest economic benefits of all alternatives considered, and enjoys considerable local support," according to Colonel Daniel M. Wilson, head of the Engineers in New England. The recommendations would prevent an estimated \$100 million in flood damages from a recurrence of a coastal storm of the magnitude of the 1978 storm. It could also prevent \$500 million in flood damages from the worst coastal storm likely to hit the area.

The \$78.9 million plan includes construction of tidal floodgates at the mouth of the Saugus River to prevent tidal surges from entering the river and flooding land throughout the project area. The floodgate structure would span 1,275 feet at the mouth of the river and would include 600 feet of gated openings to assure safe navigation passage and natural flushing in the estuary. The plan also includes a combination of dikes, walls, stone revetments, beaches and sand dunes along the Lynn shorefront and at Point of Pines in Revere. A raised embankment behind part of Revere Beach would also be included as a flood control dike and park area for public recreation.

m o r e

"The recommended plan would reduce flood damages to 5,000 buildings and major utilities, disruption of public transportation as well as provide a safer port of refuge for the 400 vessel fleet using the waterway," Colonel Wilson added. "In addition, it incorporates features that improve protection of the valuable environmental resources in the salt water estuary."

The formulation of the recommendations involved the four sponsoring communities and the Metropolitan District Commission.

The federal government would finance 65 percent or \$51.3 million of the project cost. Non-federal interests would be required to pay the remaining 35 percent or \$27.6 million.

The Engineers are currently seeking public comments on the study findings. Copies of the Draft Report and Environmental Impact Statement/Environmental Impact Report have been mailed to an extensive distribution list and are available for review at City and Town halls and libraries in the four communities. Comments should be forwarded to Colonel Wilson at the New England Division, U.S. Army Corps of Engineers, 424 Trapelo Road, Waltham, MA 02254-9149, by August 7, 1989.

INFORMATION SHEET

SAUGUS RIVER AND TRIBUTARIES FLOOD DAMAGE REDUCTION STUDY LYNN, MALDEN, REVERE AND SAUGUS, MASSACHUSETTS

The Saugus River and Tributaries Flood Damage Reduction Study examined coastal flooding problems that affect portions of the cities of Lynn, Malden and Revere, and the town of Saugus. Approximately 20,000 people live within the 4,000 acre study area which lies a few miles north of Boston, Massachusetts. The study area suffers frequently from coastal storm damages. Flooding from lesser storms disrupts the area each year; and four major coastal storms have hit the area in the past 17 years.

THE PROBLEM: The worst storm occurred in 1978. At 10:20 p.m. on February 6, the first storm surge struck. Record high tides flooded thousands of homes and buildings, knocked out electricity in freezing weather, and forced the emergency evacuation of over 4,000 people. The following morning at 10:36 a.m., when a second tidal surge hit with almost equal magnitude, many of the residents who had stayed in their homes were still stranded since access routes remained flooded. Record flood depths of up to seven feet caused damages to an estimated 3,100 buildings, and directly affected the lives of over 10,000 people and the employment of another 20,000 in the floodplain. The storm flooded major transportation arteries that are used on a daily basis by 100,000 commuters. And flood-related problems disrupted utilities which serve the entire North Shore. Remembered as the "Blizzard of '78", the storm ranks among the worst disasters in New England's history.

Rising sea levels, a trend that appears to be accelerating, will only increase this vulnerability of the study area to future coastal storms. And industrial, commercial and residential sectors within the study area continue to grow. A recurring '78 storm tide could now cause damages estimated at over \$100 million. The worst coastal storm reasonably likely to hit the area, the Standard Project Northeaster (SPN), could cripple the region, causing upwards of 10 feet of flooding and \$500 million in damages — closing the General Electric plant; affecting up to 5,000 residential, commercial, industrial and public buildings; threatening utilities serving the North Shore and disrupting the lives of over 300,000 residents and employees in these communities and the commuters who use the major transportation arteries which traverse this urban floodplain including the MBTA Blue Line, "T"-bus routes, Routes US #1, 1A-Northshore Road, 107-Lynn Marsh Road, the B&M Commuter Rail and others .

Flood waters and waves pushed inland from the ocean and which overflow seawalls become trapped behind Revere Beach in Lynn, East Saugus and other parts of Revere and Malden. Rising water inundates the estuary wetlands and adjacent developed lands, often resulting in interior flood levels that are significantly higher than high tide levels offshore. An ocean level of 1 foot above a yearly high tide results in wet basements in approximately 400 buildings. A storm tide level of just 2 feet above a yearly tide requires the emergency evacuation of people from several thousand buildings. Thus only a slim margin exists between a coastal storm tide that causes little disturbance and one that can mean major disaster.

THE STUDY SCOPE AND PROCESS: The study area also has environmental resources that are of substantial importance to Metropolitan Boston. Situated around the largest saltwater estuary (1,660 acres) near Boston and along 5 miles of coastline, it provides nursery and habitat for fish resources, habitat for birds and wildlife, and opportunities for many types of recreational and other uses. The study area also harbors nearly 800 commercial and recreational navigation vessels, half of which are moored along the Saugus and Pines Rivers.

In its search for answers to the coastal flooding problems, the study had to examine eight separate areas within four jurisdictions; and address concern about wetlands, water quality, and about rising recreational needs. The study also had to explore regional approaches to coastal flooding problems — approaches that could require extensive cooperation among community and state leaders and among the diverse groups and state and Federal agencies whose interests were at stake in resolving the flooding problems; protecting the area's natural, scenic and/or recreational resources; improving the local economic climate, or all of these concerns.

A public participation program was set up to provide continuous two-way communication throughout the planning process and help assure that the study addressed all of the local concerns and objectives. Four Citizens Steering Committees (one from each community) and a Technical Group were formed and worked together throughout the study. In addition to regular meetings of these committees, over 100 meetings were held with the public, and nearly 2,000 interviews were conducted to gather information regarding flood problems and to explore the acceptability of alternative solutions.

FORMULATION OF PLANS: Three potential solutions were developed and evaluated:

- **THE LOCAL FLOOD PROTECTION PLANS** would have required nine miles of new walls and dikes along the shoreline and estuary. Although economically justified, the plans were not favored by the communities due to disturbance to real estate, impaired views and other aesthetic impacts, financial constraints, and the potential loss of 38 acres of vegetated wetlands and intertidal habitat.
- **THE NONSTRUCTURAL FLOOD PROTECTION PLAN** would have relied on flood-proofing and the installation of improved warning systems. This plan was not supported by the local communities because of its limited capacity to provide an adequate early warning and reduce flood impacts. Only about 7 percent of residents in the floodplain would have benefitted.
- **THE REGIONAL FLOODGATE PLAN** evaluated a system of interrelated structural and nonstructural features. The plan would provide a very high degree of flood protection against the Standard Project Northeaster (SPN) event for nearly the entire study area. It yielded the highest net economic benefits of all the solutions, has no significant impacts on the estuary, and minimal social impacts. The plan offers a high level of regional flood protection, complements State and local environmental management goals, and enjoys considerable local support. It is the recommended plan.

THE SELECTED REGIONAL PLAN: The Regional Floodgate Plan calls for construction of tidal floodgates at the mouth of the Saugus River to prevent tidal surges from entering the river and flooding land throughout the study area. The floodgates would span 1,275 feet at the mouth of the river and include 600 feet of gated openings so as to maintain both safe passage for navigation and natural tide levels and flushing patterns in the estuary. The gates would only be closed two or three times a year, when projected tide levels are expected to cause sig-

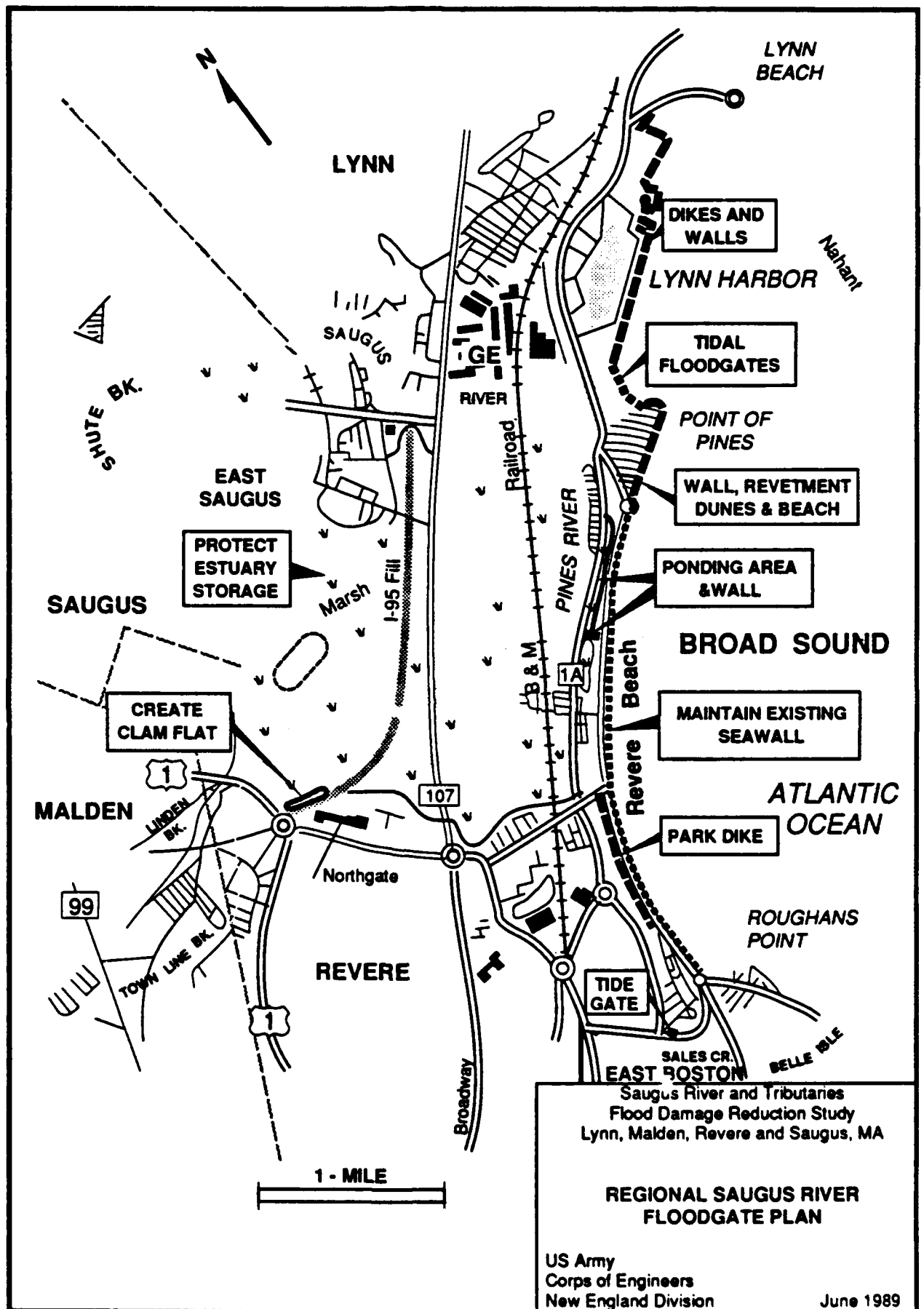
nificant damages. Closure would last one to two hours during the peak of the tide, except during very severe coastal storms, such as a recurrence of the Blizzard of '78, when the gates would be closed for a longer period of time and possibly for more than one high tide. With sea level rise, the future frequency of closure could increase. To help reduce localized wave overtopping which has contributed to flood damages in the past, a combination of dikes, walls, stone revetments, beaches and sand dunes in Lynn and at Point of Pines as well as, a dike to be developed for park land behind Revere Beach and protection of a wetland ponding area and a wall built at it's south end, would also be needed. And protection of the tidal wetlands in the Saugus and Pines River estuary will permit use of the natural storage capacity of this area for temporary impoundment of runoff that occurs behind the floodgates and of salt water that may result from tidal overtopping at Revere during gate closure. Strict enforcement of modified flood plain zoning along the borders of the estuary and existing wetland protection regulations will be required to maintain this element of the overall plan. The project causes a loss of approximately 10 acres of mostly intertidal habitat at the location of project features along the coast. This loss will be replaced through the creation of 10 acres of clam flats at the I-95 embankment.

Among the direct benefits offered by the Regional Plan are:

- Reduced flood damages to 5,000 buildings and major gas, electrical and wastewater treatment facilities serving the North Shore, providing an estimated \$7.0 million average annual benefits and the prevention of up to \$500 million in damages in the event of an SPN flood.
- Prevention of damages and temporary public transportation costs along 20 miles of major floodprone public transportation arteries which serve Boston's North Shore.
- Plus, reduced damages to existing shorefront infrastructure, substantial reductions in the need for and costs of emergency public services; a safer port of refuge for the 400 vessel fleet moored in the estuary, improved protection against future sea level rise; and development of a 3,400 foot long dike with joint flood control and public park land use.

The \$78.9 million Regional Plan would have an average annual cost of \$8,942,000 which includes \$325,000 per year for operation, maintenance and major replacements. The plan produces average annual benefits of \$10,860,000, primarily from flood damage reduction. Thus the project's net benefits are \$1,918,000, with a benefit to cost ratio of 1.2.

The Federal Government would finance 65 percent, or \$51,300,000 of the project cost. The state sponsor, the Metropolitan District Commission, in cooperation with the other study sponsors, the cities of Lynn, Malden and Revere and the town of Saugus, will need to establish procedures and commitments for meeting cost-sharing and long-term operation and maintenance responsibilities. The non-Federal cost of the project is 35 percent or \$27,600,000 (includes \$3,644,000 in Real Estate and \$695,000 in relocation or alternations to existing utilities). The state sponsor would be required to provide cash contributions estimated at \$23,261,000 during construction which is currently scheduled to start in fiscal year 1994, in addition to meeting the real estate and relocation requirements. Following completion of the project, an estimated \$325,000 per year operation and maintenance cost would be a continuing non-Federal responsibility.



Army engineers unveil plan to relieve flooding problems

Coastal flood damage reduction in the Saugus River areas of Lynn, Malden, Revere and Saugus can best be achieved by implementation of a regional floodgate plan. This finding stems from a 3½ year, \$2.5 million study recently completed by the U.S. Army Corps of Engineers.

"The regional floodgate plan provides a very high level of coastal flood protection, yields the highest economic benefits of all alternatives considered, and enjoys considerable local support," according to Colonel Daniel M. Wilson, head of the Engineers in New England. The recommendations would prevent an estimated \$100 million in damages from a recurrence of a coastal storm of the magnitude of the 1978 storms. It could also prevent \$500 million in damages from the worst coastal storm likely to hit the area.

The \$78.9 million plan includes construction of tidal floodgates at

the mouth of the Saugus River to prevent tidal surges from entering the river and flooding land throughout the project area. The floodgate structure would span 1,275 feet at the mouth of the river and would include 600 feet of gated openings to assure safe navigation passage and natural flushing in the estuary. The plan also includes a combination of dikes, walls, stone revetments, beaches and sand dunes along the Lynn shorefront and at Point of Pines in Revere. A raised embankment behind part of Revere Beach would also be included as a flood control dike and park area for public recreation.

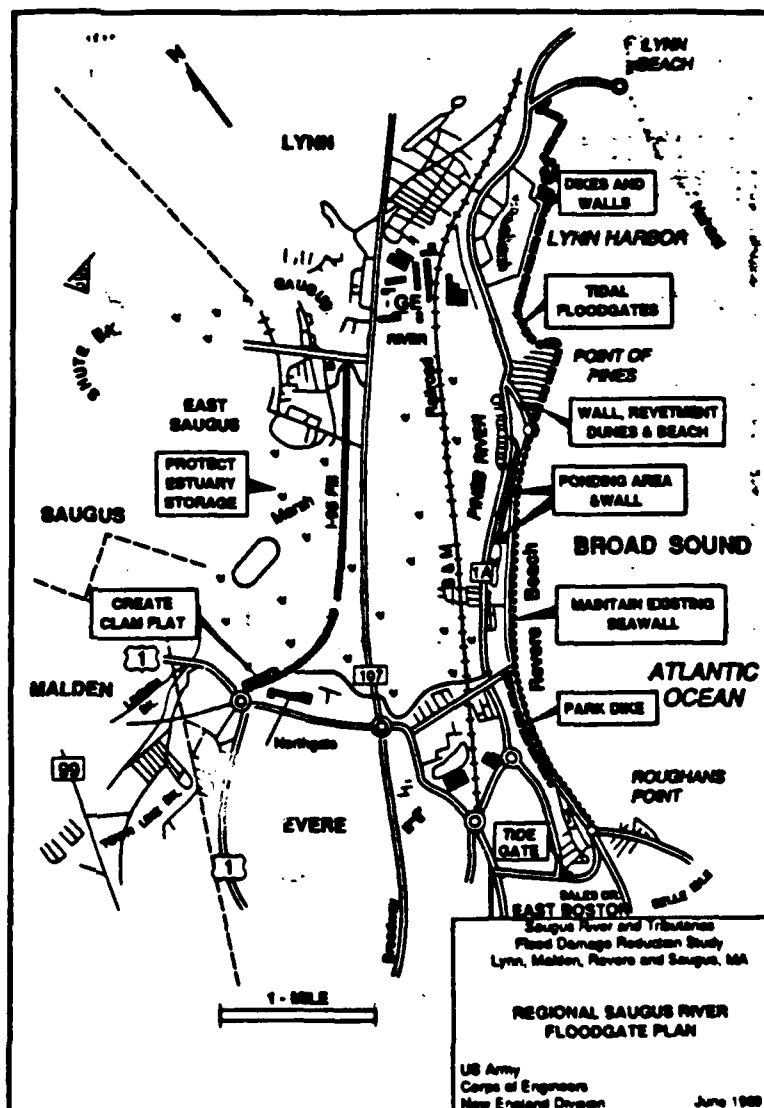
"The recommended plan would reduce flood damages to 5,000 buildings and major utilities, disruption of public transportation as well as provide a safer port of refuge for the 400 vessel fleet using the waterway," Colonel Wilson added. "In addition, it incorporates features that improve pro-

tection of the valuable environmental resources in the salt water estuary."

The formulation of the recommendations involved the four sponsoring communities and the Metropolitan District Commission.

The federal government would finance 65 percent of \$51.3 million of the project cost. Non-federal interests would be required to pay the remaining 35 percent or \$27.6 million.

The engineers are currently seeking public comments on the study findings. Copies of the Draft Report and Environment Impact Statement/Environmental Impact Report have been mailed to an extensive distribution list and are available for review at city and town halls and libraries in the four communities. Comments should be forwarded to Colonel Wilson at the New England Division, U.S. Army Corps of Engineers, 424 Trapelo Road, Waltham, MA 02254-9149, by Aug. 7.



LYNN Item 6/21/87

But coastal residents and business owners who weathered the ravages of the Blizzard of '78 and subsequent storms said any money spent by communities on the flood reduction work is money well spent.

Revere resident Elaine Harley's experience with the ravages of coastal storms is documented indirectly in the corps project report. Her house is shown surrounded by water after a storm in January 1987.

Revere would be protected from future storms with a 3,400-foot dike that would be constructed between Revere Beach Boulevard and Ocean Avenue. The dike would be built from earth and stone and prevent water from flowing across North Shore Road and the commuter rail tracks.

Four thousand feet of walls, sloped stone revetments and artificial dunes would stretch around Point of Pines to protect this vulnerable stretch of coastline and the homes along it against flooding. Another 9,000 feet of dikes and walls ranging in height to 17 feet would be built along Lynn Harbor as a barrier against what John Ryder, president of Bay Marine, vividly remembers happened 11 years ago.

Residents and fellow merchants share Ryder's assessment of the project's value but some are not looking forward to the disruption it will cause during construction. Truck traffic, construction noise and dust will be minimized in Lynn and Saugus according to corps Project Manager Robert Hunt.

The Lynn Harbor walls will be built along vacant or nearly empty stretches of the waterfront while the floodgates will be built from barges moored in the Saugus River and loaded in Lynn. Hunt said the corps hopes to use piers owned by Lynn Economic Development and Industrial Corp. and Bay Marine as staging areas for construction materials loaded on the barges.

Saugus River lobstermen have been assured that the river mouth will be kept open to boats during construction, says Harbormaster Vincent Cicolini.

But Hunt acknowledged that trucks — up to a dozen a day — will have to travel down Rice Avenue with sand and rock for the Point of Pines walls. Beachgoers may find the disruptions caused by the impending Revere Beach re-sanding project extended while the corps builds the dikes to protect the beach from storms.

The Lynn and Revere stretches will be built in the first nine months of the project with the floodgates taking nearly three years to construct.

Residents are also worried about the project's upkeep after its completion. Hunt said the Metropolitan District Commission (MDC) to date has been designated as the upkeep agency for the project. Most of the \$325,000 annual maintenance cost involves servicing the floodgates and ensuring two operators are stationed at them around the clock in case of a storm.

By THOR JOURGENSEN
Iron Staff

In one of the most massive construction proposals in the history of the North Shore the Army Corps of Engineers has revealed plans to build a sand, stone and steel storm barrier on the coast from Revere Beach to Lynn Harbor.

If all hurdles are overcome construction could begin in 1983 and take four years.

The key feature of the project would be a 1,300 foot-long series of tidal floodgates spanning the mouth of the Saugus River on the ocean side of the General Edwards Bridge. The gates would be closed when storm waters threatened to damage river marsh areas and boat moorings.

Once completed in 1987 the regional floodgate would shelter thousands of homes and businesses as well as beaches and protected marshes and clam flats from storms like the Blizzard of 1978 which caused more than \$100 million in damage.

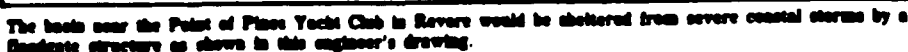
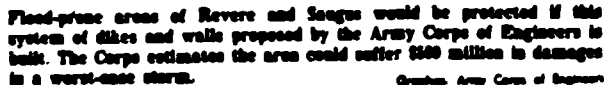
The federal Army Corps of Engineers will spend the summer accepting and reviewing comments on the plan and its affect on the coastal environment. Barring major objections from state agencies and local officials and residents the corps will begin four years of design work on the project in the fall.

The first stages of design work will parallel discussions among federal, state and local officials on how the \$79 million project will be funded. The state is giving the corps access to rights-of-way and land tracts for the project worth over \$4 million. State agencies and the three communities the barrier walls will straddle will have to kick in \$23.3 million — a prospect that has officials like Lynn City Planner Kevin Geaney doubting cash-strapped communities can come up with the required contribution.

"You can be sure the city of Lynn isn't going to kick in anything," Geaney said.

State Sen. Walter Boverini, D-

FLOOD, Page 12



**ENVIRONMENTAL PROTECTION
AGENCY**

(ER-FRL-3807-2)

**Environmental Impact Statements;
Availability**

Responsible Agency: Office of Federal
Activities, General Information (202)
382-5073 or (202) 382-5075. Availability
of Environmental Impact Statements
Filed June 12, 1989 Through June 16, 1989
Pursuant to 40 CFR 1508.9.

**EIS No. 860163, Draft, COE, MA,
Saugus River and Tributaries Flood
Damage Reduction Plan.
Implementation, Lynn, Malden, Revere
and Saugus Communities, Essex,
Middlesex and Suffolk Counties, MA.**

**Due: August 7, 1989. Contact: Joseph
Horowitz (617) 647-6518.**

Refr: Environmental Monitor, June 26, 1989

NOTICES. ENVIRONMENTAL IMPACT REPORTS RECEIVED

The following Environmental Impact Reports are available for review and comment

<u>EISA NO.</u>	<u>PROJECT AND LOCATION</u>	<u>DUE DATE FOR COMMENTS</u>
7389 DRAFT	BOYNTON YARDS REVITALIZATION, SOMERVILLE CITY OF SOMERVILLE (FOR INFORMATION, JACKI WILKINS, 727-5830) (COPIES, DONAL BORCHELT, 625-6600)	JULY 26, 1989
* 6487 DRAFT	SAUGUS RIVER FLOOD DAMAGE REDUC. STUDY MAIN REPORT PLUS SEVEN VOLUMES OF APPENDICES HS/COMPS OF ENGINEERS (FOR INFORMATION, DAVE SHEPARDSON, 727-5830) (COPIES, JOSEPH HOROWITZ, 647-6518)	AUGUST 7, 1989

U.S. Army Corps of Engineers Schedule Workshop

WALTHAM — A workshop for Point of Pines residents has been scheduled by the U.S. Army Corps of Engineers for June 30, to discuss how the proposed Regional Saugus

River Floodgate Plan would affect them. The plan would reduce flood damages in Lynn, Malden, Revere, and Saugus from coastal storms

similar to the Blizzard of '78. The session will be held at St. John Vianney Church on Harrington Ave. in the Point of Pines section of Revere, and will begin at 7 p.m.

"The workshop will afford Point of Pines residents an opportunity to review the results of our study to date and to hear more about the tentatively selected plan," according

to Colonel Thomas A. Rhen, head of the engineers in New England.

The engineers, working in cooperation with federal, state, and local officials and citizens groups, have developed a plan to provide protection for 5,000 residences and businesses in the four communities. It calls for combining more than

three miles of walls and dikes along the shore with a floodgate structure across the mouth of the Saugus River.

"Revere Mayor George Colella has recently asked us to investigate the feasibility of including the Point of Pines area in our Regional Saugus River Floodgate Plan," Colonel Rhen added.

Under a separate study of Point of Pines completed by the engineers in 1984, construction of a local protection project had been recommended to provide flood control to this vulnerable area. However, because the state requires public access to the beach area for any project in which state funds are used and the city's inability to finance the local share by itself, design work for the Point of Pines Local Protection Project was discontinued. That project would involve non-federal funds of \$1.8 million.

"By modifying the original Point of Pines project and tying it into the proposed Regional Saugus River Floodgate Plan, more complete protection for the entire region can be provided," Colonel Rhen noted.

"Without full protection along Point of Pines, flooding there could enter the Saugus River estuary and jeopardize the integrity of the entire Saugus River Floodgate Project," he added.

The overall project, including Point of Pines, has an estimated cost of \$57 million. Of this amount, the federal government would fund 65 percent, with non-federal interests being responsible for the remainder. The Metropolitan District Commission has agreed to act as the non-federal sponsor for the project.

"We hope to work with the residents of Point of Pines to develop an acceptable plan to meet their needs and the needs of the region," Colonel Rhen said.



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

June 27, 1989

Planning Division
Basin Management Branch

SUBJECT: Saugus River and Tributaries, Flood Damage Reduction Study
- Technical Group Meeting

Date and Time: Tuesday, July 18, 1989 from 1:00 - 4:00 pm

Place: The McCormack State Office Building
1 Ashburton Place, Boston, MA
Conference Room #1 - 21st Floor
(Map attached)

To: Technical Group Members

Dear Study Participant:

This is to confirm the scheduling of our Technical Group Meeting for July 18, at about the midpoint of the 45 day review period for the Draft Study Report and EIS/EIR. We hope you can attend. The agenda for the meeting will be as follows:

1. Introduction and brief project update
2. Discussion of Draft Study Report and EIS/EIR
3. Other topics of concern to members

The primary purpose of this meeting will be to answer questions concerning the Draft Study Report and EIS/EIR and to permit open discussion amongst the members on topics of mutual concern or interest.

We hope to see you at the meeting. If you have any questions please feel free to call me at 617-647-8508, Bob Hunt, the Project Manager (647-8216), or Joe Horowitz, the Project Environmental Manager (647-8518).

Sincerely,


for Joseph L. Ignazio
Chief, Planning Division

Enclosure



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

June 29, 1989

Planning Division
Basin Management Branch

Dear Citizen Steering Committee Members,
State Legislators and Congressional Representatives:

I am pleased to invite you to a joint Citizen Steering Committee meeting scheduled for July 20, 1989 at 7 P.M. in Lynn City Hall, Room 302. The meeting will provide an overview of the Saugus River and Tributaries, Flood Damage Reduction Study, Main Report and EIS/EIR which is out for public review - comments due August 7. The selected plan is the Regional Floodgate Plan which would protect the cities of Lynn, Malden and Revere, and the town of Saugus from coastal flooding. Very important is the need to discuss project implementation and cost sharing which is why the communities have requested their congressional and state legislative delegation be invited to attend, as well as the Metropolitan District Commission, the State Sponsor.

Also, spread the word that a PUBLIC WORKSHOP for residents of the four communities is scheduled for July 27 in the Revere High School Auditorium at 7 P.M. News releases will also announce the Public Workshop which will explain the study/project and answer questions.

I hope you can attend both meetings. If you have any questions, please feel free to call me at (617) 647-8508, the Project Manager, Bob Hunt at 647-8216, or the Project's Environmental Manager, Joe Horowitz (647-8518). For your information, invitations were sent to those on the attached list, and maps are enclosed for the two meetings.

Sincerely,

Enclosures

Joseph L. Ignazio
for Joseph L. Ignazio
Chief, Planning Division

INVITATIONS SENT

SAUGUS RIVER AND TRIBUTARIES FLOOD DAMAGE REDUCTION STUDY CITIZEN STEERING COMMITTEES

REVERE

Frank Stringi, Director, Planning and Community Development (Study Coordinator)
John Arrigo, Revere City Council
Paul A. Cacciola, Staff Engineer
George DelGreco, Harbor Master
Daniel Ferrara, Civil Defense Director
Ellen Haas, Chairperson, Revere Beach Citizens Advisory Comm. & Concerned Coastal Sportsmen Assoc.
Elaine Hurley, President, Pines River Association
Rose LaQuaglia, Vice President, Oak Island Residents Association
Joseph A. LaValle, Chairman, Revere Conservation Commission
Marke Locke, President, Point of Pines Beach and Conservation Association
John R. Marino, Revere Conservation Commission
Carl Minkovitz, Trustee, Point of Pines Beach and Conservation Association
Richard Penn, Revere City Council
Vincent A. Piccinni, Commodore, Point of Pines Yacht Club
Ralph Sandberg, Director, Oak Island Residents Association
Art Vulgaropulous - Consultant to Revere Conservation Commission

Other Revere Interests:

George V. Colella, Mayor of Revere
Cong. Edward J. Markey (Revere and Malden) and Kevin Casey, Cong. Aide
Francis D. Doris, Massachusetts Senate (Revere and Malden)
Rep. William Reinstein (Revere and Malden) and James Powers, Aide
Rep. Alfred E. Saggase (Revere) and Ann Sullivan, Legis. Asst.
Linda Rosa, Councillor-at-Large
Douglas Boyle, *Saugus Advertiser* and *Revere Journal*

SAUGUS

John Mahoney, Director, Planning and Community Development (Study Coordinator)
Richard Barry, Town Selectman
Chris Ciampa, President, Italian Civic Association
Vincent Cicolini, Harbor Master
Anne Cyros, Saugus Conservation Commission
Michael Favale, Civil Defense Director
Robert Lavoie, Saugus Water Front Task Force
Richard Mytkowicz, Pres., Saugus Action Volunteers for the Environment (SAVE)
Dennis Roy, former Town Engineer

Other Saugus Interests:

Norman B. Hansen, Town Manager,
Nicholas Mavroules (Saugus and Lynn) and Virginia A. DeRosa, Cong. Aide
Sen. Walter J. Boverini, Mass. Senate (Lynn and Saugus) and William Kane, Staff
Francis D. Doris, Massachusetts Senate (Saugus and Revere)
Rep. Steven V. Angelo (Saugus and Lynn) and Tara O'Donnell, Staff Assistant
Janette Fasano, Chairperson, Board of Selectmen
Peter Manoogian, Board of Selectmen
Mary D'Amico, Town Meeting Member
Kenneth Foley, Town Meeting Member
Stephen Mitton, Town Meeting Member
Michael Sciranza, Town Meeting Member and Chairman, Task Force
Ellen Burns, SAVE,
Andrew Ajemian, *Prime Times*

(continued)

CITIZEN STEERING COMMITTEES (continued)

LYNN

Stephen L. Smith, Assistant City Planner; Planning Department (Study Coordinator)
Norman Cole, City Council, Ward 6
Harry W. Coppola, City Councillor, Ward 7
Peter M. DeVeau, Deputy Director, Office of Economic Development
John M. Monaco, Civil Defense Director
Paul A. Petrowski, Vice Chairman, Conservation Commission
James Ryan, City Engineer, Department of Public Works
John E. Ryder, Pres., Bay Marine Trust and Lynn Area Chamber of Commerce
Linda Williams, Citizen-at-Large

Other Lynn Interests:

Albert V. DiVirgilio, Mayor of Lynn
Cong. Nicholas Mavroules (Saugus and Lynn) and Virginia A. DeRosa, Cong. Aide
Sen. Walter J. Boverini, Massachusetts Senate, and William Kane, Staff
Rep. Steven V. Angelo, (Lynn and Saugus) and Tara O'Donnell, Staff Assistant
Rep. Vicent Lozzi (Lynn) and Cathy Bresnahan, Staff
Rep. Thomas W. McGee, Massachusetts House of Representatives
Paul Stevens, General Electric
Joyce Delehanty - *Lynn Item*

MALDEN

John Russell, Staff Engr. - Malden Redevelopment Authority (Study Coordinator)
Robert Keddie, Malden Conservation Commission
Jack Kelly, City Engineer, Engineering Department
Henry J. Mulhern, Exec. Dir., Malden Redevelopment Authority
Deborah Burke Santoro, Public Information Officer

Other Malden Interests

James S. Conway, Mayor of Malden
Cong. Edward J. Markey, and Kevin Casey, Congressional Aide
Sen. John A. Brennan, Jr. (Malden) and Michael McCarthy, Aide
Rep. Michael J. McGlynn - Massachusetts House of Representatives (Malden)
Rep. John C. McNeil (Malden) and Heidi Kahn, Staff
Rep. William Reinstein (Revere and Malden) and James Powers, Aide
Alfred L. Thurlow, Principal Planner, Malden

GOVERNOR'S OFFICE

Ms. Rebecca Calahan Regional Coordinator, Governor's Office of Economic Development

METROPOLITAN DISTRICT COMMISSION

Ilyas Bhatti	Commissioner, MDC
Francis D. Faucher	Director, Parks Eng. & Construction
Julia O'Brien	Director, Planning
Carney Terzian	Parks Eng. & Construction
Paul DiPietro	Parks Eng. & Construction
Henry A. Higgott	Parks Eng. & Construction
Joseph P. Orfant	Planning



US Army Corps
of Engineers
New England Division

News Release

Release No. 89-321

Contact: Sue Douglas

For Release: Upon Receipt

Phone: 617-647-8264

424 Trapelo Road, Waltham, MA. 02254-9149

July 12, 1989



ENVIRONMENT



FLOOD CONTROL



MILITARY CONSTRUCTION



NAVIGATION



RECREATION



RIVER SYSTEMS



SHORE PROTECTION

ENGINEERS SCHEDULE WORKSHOP ON NORTH SHORE FLOOD CONTROL PROJECT

WALTHAM, Mass. — Coastal flood damage reduction in the Saugus and Pines rivers and Broad Sound areas of Lynn, Malden, Revere and Saugus will be the topic of a public workshop to be held at 7:00 P.M. in Revere High School on July 27, 1989. The session will focus on a regional floodgate plan proposed by the U.S. Army Corps of Engineers. The three and one-half year long investigation is sponsored by the four communities and the Metropolitan District Commission.

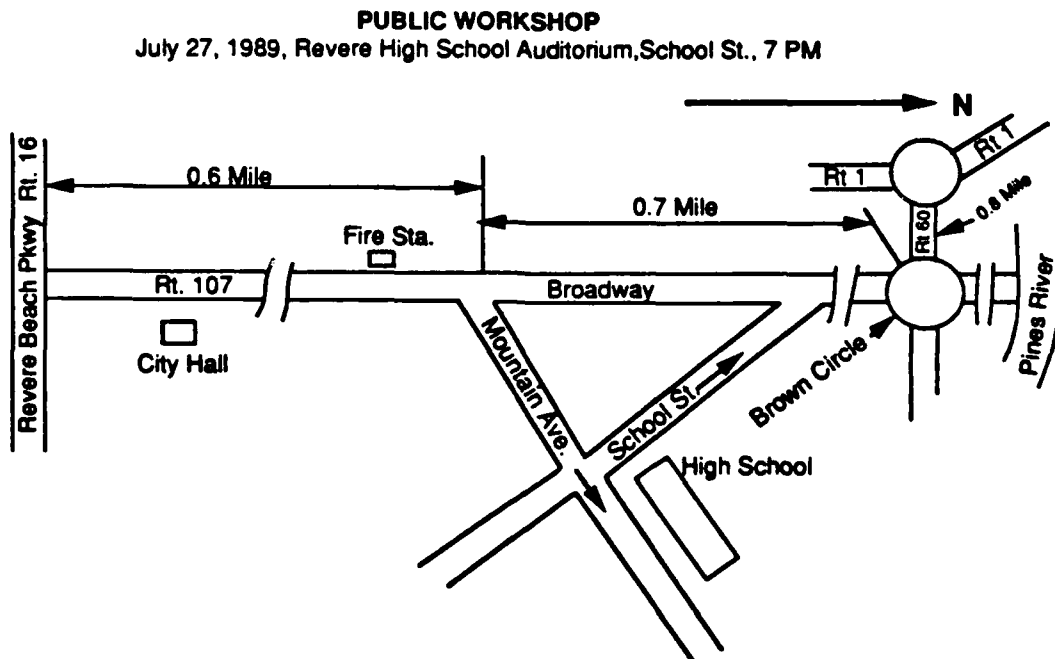
"The public workshop will afford all interests an opportunity to gain a better understanding of the recommended plan," according to Colonel Daniel M. Wilson, head of the Engineers in New England.

The Engineers have recommended construction of tidal floodgates at the mouth of the Saugus River to prevent tidal surges from entering the river and flooding land throughout the four-community project area. The floodgate structure would span 1,275 feet at the mouth of the river and would include 600 feet of gated openings to assure safe navigation passage and natural flushing in the estuary. The plan also includes a combination of dikes, walls, stone revetments, beaches and sand dunes along the Lynn shorefront and at Point of Pines in Revere. A raised embankment behind part of Revere Beach would also be included as a flood control dike and park area for public recreation.

m o r e

The \$78.9 million proposal would reduce flood damages to 5,000 buildings and major utilities serving the north shore. It would also minimize disruption of public transportation and provide a safer port of refuge for the 400 vessel fleet using the waterway. The estuary's natural flood water storage area receives protection under the plan. The federal government would finance 65 percent or \$51.3 million of the project cost. Nonfederal interests would be required to provide the remaining 35 percent or \$27.6 million. The construction period is scheduled to start in 1994. A draft study report and environmental impact statement on the project are under public review until August 7.

INFORMATION SHEETS ATTACHED





US Army Corps
of Engineers
New England Division

Project Information

424 Trapelo Road, Waltham, MA 02254-9149

SAUGUS RIVER AND TRIBUTARIES FLOOD DAMAGE REDUCTION STUDY LYNN, MALDEN, REVERE AND SAUGUS MASSACHUSETTS

The study of flood damage reduction on the Saugus River and Tributaries by the U.S. Army Corps of Engineers examined coastal flooding problems that affect portions of the cities of Lynn, Malden and Revere, and the town of Saugus. Approximately 20,000 people live within the 4,000 acre study area which lies a few miles north of Boston, Massachusetts. The study area suffers frequently from coastal storm damages. Flooding from lesser storms disrupts the area each year; and four major coastal storms have hit the area in the past 17 years.

THE PROBLEM

The worst storm occurred in 1978. At 10:20 p.m. on February 6, the first storm surge struck. Record high tides flooded thousands of homes and buildings, knocked out electricity in freezing weather, and forced the emergency evacuation of over 4,000 people. The following morning at 10:36 a.m., when a second tidal surge hit with almost equal magnitude, many of the residents who had stayed in their homes were stranded since access routes remained flooded. Record flood depths of up to seven feet caused damages to an estimated 3,100 buildings, and directly affected the lives of over 10,000 people and the employment of another 20,000 in the floodplain. The storm flooded major transportation arteries used daily by 100,000 commuters. Flood-related problems disrupted utilities which serve the entire North Shore. Remembered as the "Blizzard of '78", the storm ranks among the worst disasters in New England's history.

Rising sea levels, a trend that appears to be accelerating, will only increase this vulnerability of the study area to future coastal storms. Industrial, commercial and residential sectors within the study area continue to grow. A recurring '78 storm tide could now cause damages estimated at over \$100 million. The worst coastal storm reasonably likely to hit the area, the Standard Project Northeaster (SPN), could cripple the region, causing upwards of 10 feet of

flooding and \$500 million in damages. It would close the General Electric plant; affect up to 5,000 residential, commercial, industrial and public buildings; threaten utilities serving the North Shore and disrupt the lives of over 300,000 residents and employees in these communities. Commuters who use the major transportation arteries which traverse this urban floodplain including the MBTA Blue Line "T"-bus routes, Routes US #1, 1A-Northshore Road, 107, Lynn Marsh Road, the B&M Commuter Rail and others would also suffer.

Flood waters and waves pushed inland from the ocean and which overflow seawalls become trapped behind Revere Beach in Lynn, East Saugus and other parts of Revere and Malden. Rising water inundates the estuary wetlands and adjacent developed lands, often resulting in interior flood levels that are significantly higher than high tide levels offshore. An ocean level of 1 foot above a yearly high tide results in wet basements in approximately 400 buildings. A storm tide level of just 2 feet above a yearly tide requires the emergency evacuation of people from several thousand buildings. Only a slim margin exists between a coastal storm tide that causes little disturbance and one that can mean major disaster.

THE STUDY SCOPE AND PROCESS

The study area has environmental resources that are important to Metropolitan Boston. Situated around the largest saltwater estuary (1,660 acres) near Boston and along 5 miles of coastline, it provides nursery and habitat for fish resources, habitat for birds and wildlife, and opportunities for many types of recreational and other uses. The study area also harbors nearly 800 commercial and recreational navigation vessels, half of which are moored along the Saugus and Pines Rivers.

In its search for answers to the coastal flooding problems, the U.S. Army Corps of Engineers examined eight separate areas within four jurisdictions and addressed concern about wetlands, water quality, and rising recreational needs. We also explored regional approaches to coastal flooding problems - approaches that could require extensive cooperation among elected leaders, diverse groups and state and Federal agencies in resolving the flooding problems; protecting the area's natural, scenic and/or recreational resources and improving the local economic climate.

A public participation program was set up to provide continuous two-way communication throughout the planning process and help assure that the study addressed all of the local concerns and objectives. Four Citizens Steering Committees (one from each community) and a Technical Group were formed and worked together throughout the study. In addition to regular meetings of these committees, over 100 meetings were held with the public, and nearly 2,000 interviews were conducted to gather information regarding flood problems and to explore the acceptability of alternative solutions.

FORMULATION OF PLANS

Three potential solutions were developed and evaluated:

THE LOCAL FLOOD PROTECTION PLANS would have required nine miles of new walls and dikes along the shorefront and estuary. Although economically justified, the plans were not favored by the communities due to disturbance to real estate, impaired views and other aesthetic impacts, financial constraints, and the potential loss of 38 acres of vegetated wetlands and intertidal habitat.

THE NONSTRUCTURAL FLOOD PROTECTION PLAN would have relied on flood-proofing and the installation of improved warning systems. This plan was not supported by the local communities because of its limited capacity to provide an adequate early warning and reduce flood impacts. Only about 7 percent of residents in the floodplain would have benefitted.

THE REGIONAL FLOODGATE PLAN evolved as the recommended plan. It evaluated a system of interrelated structural and nonstructural features. The plan would provide a very high degree of flood protection against the Standard Project Northeaster (SPN) event for nearly the entire study area. It yielded the highest net economic benefits of all the solutions, has no significant impacts on the estuary, and minimal social impacts. The plan offers a high level of regional flood protection, complements State and local environmental management goals, and enjoys considerable local support.

THE SELECTED REGIONAL PLAN

The Regional Floodgate Plan calls for construction of tidal floodgates at the mouth of the Saugus River to prevent tidal surges from entering the river and flooding land throughout the study area. The floodgates would span 1,275 feet at the mouth of the river and include 600 feet of gated openings so as to maintain both safe passage for navigation and natural tide levels and flushing patterns in the estuary. The gates would only be closed two or three times a year, when projected tide levels are expected to cause significant damages. Closure would last one to two hours during the peak of the tide, except during very severe coastal storms, such as a recurrence of the Blizzard of '78, when the gates would be closed for a longer period of time and possibly for more than one high tide. With sea level rise, the future frequency of closure could increase. To help reduce localized wave overtopping (which has contributed to flood damages in the past), a combination of dikes, walls, stone revetments, beaches and sand dunes in Lynn and at Point of Pines would also be needed. A dike to be developed for park land behind Revere Beach and protection of a wetland ponding area and a wall built at its south end, are part of the project. Protection of the tidal wetlands in the Saugus and Pines River estuary will permit use of the natural storage capacity of this area for temporary impoundment of runoff that occurs behind the floodgates and of salt water that may result from tidal overtopping at Revere during gate closure. Strict enforcement of modified flood plain zoning

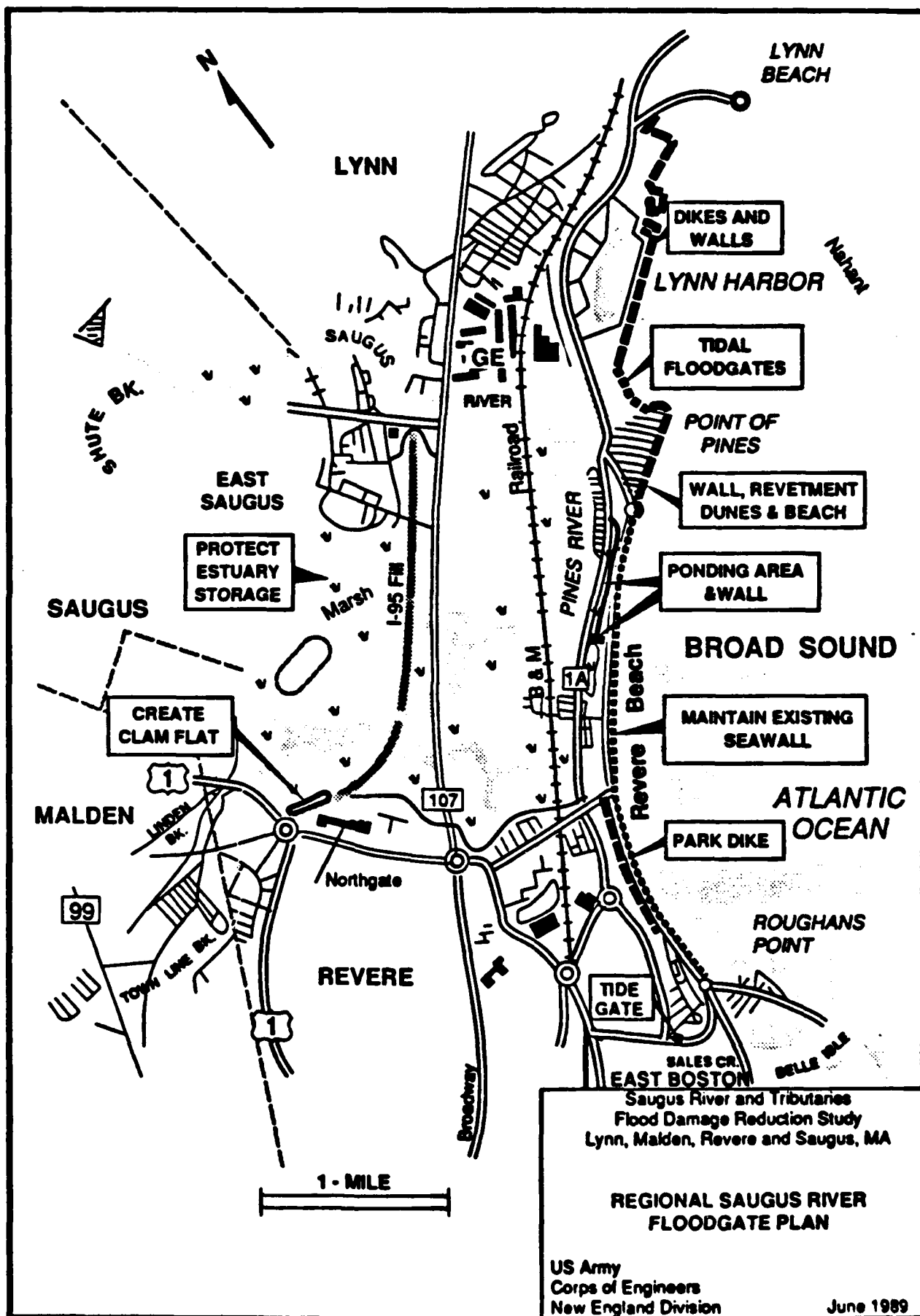
levels would cause damages of \$33 million. The SPN, with depths up to 9 feet, would cause damages of \$80 million with sea level rise.

At Point of Pines, which is located just north of Revere Beach along the Saugus River, about 370 homes were flooded with depths to 4 feet during the '78 Blizzard and two houses burned when fire equipment was unable to reach them. The area is one of the most vulnerable to coastal storms and was extremely hard hit by the Blizzard of '78. Severe overtopping also occurred in 1972 and 1979, and in 1987 the ocean flowed in freely by the Yacht Club along the Saugus River. In 1978, residents remained stranded overnight with no heat, electricity or means of evacuation.

Northgate, an area with 180 homes and businesses, including the city's DPW garage, lies along the edge of the Pines River marsh. This area experienced flood waters up to 3 feet deep in 1978 when the estuary rose like a huge lake, flooding these buildings.

COASTAL STORM DAMAGES IN TOWN LINE BROOK (REVERE AND MALDEN)

The Town Line Brook area (including Linden Brook) lies in both Revere and Malden. The estimated SPN (1989 tide levels) floodplain includes about 210 buildings in Malden and another 800 in Revere which are subject to flooding directly from the Pines River and from the backup of drainage in the brooks during high tides. Flooding occurred in this area during the Blizzard of '78, and in 1979 with flood levels reaching Elevation 7 to 8 feet NGVD on both occasions, with 3 to 4 foot depths of water. In 1987 waters reached the top of the banks of Town Line Brook. Most of the flood problems in this area will be addressed by the MDC Town Line Brook flood control project.





US Army Corps
of Engineers
New England Division

Project Information

424 Trapelo Road, Waltham, MA 02254-9149

COASTAL FLOODING PROBLEMS IN LYNN, MALDEN, REVERE AND SAUGUS WHICH WOULD BE PREVENTED BY THE REGIONAL PROJECT

This article describes the problems associated with coastal flooding in the study area: the tidal floodplain of the cities of Lynn, Revere and Malden and the town of Saugus. What is notable about these flooding problems is not only their very substantial local impacts, but their influence on utilities, public transportation, work force and other aspects of the economy of the surrounding region.

FLOOD PROBLEMS IN THE STUDY AREA

In total, the study area includes about 5,000 buildings, including over 8,000 housing units, approximately 4,000 acres of residential, industrial and commercially developed land and tidal wetlands, and major transportation arteries and utilities that serve Boston's North Shore. The following information on conditions that were experienced during the '78 Blizzard and subsequent storm events was obtained during over 2,000 interviews with residents, business owners and officials familiar with the study area.

At 10:20 p.m. on Monday night, February 6, 1978, the first storm surge associated with the Blizzard of '78 hit the study area. Record high tides flooded thousands of homes and buildings, knocked out electricity in freezing weather, and forced the emergency evacuation of over 4,000 people. The following morning at 10:36 a.m., when a second tidal surge hit the study area with almost equal magnitude, many of the residents who had stayed in their homes were still stranded since access routes remained flooded. Record flood depths of up to seven feet caused damages to an estimated 3,100 buildings, and directly affected the lives of over 10,000 people and the employment of another 20,000 who lived or worked in the floodplain. The storm flooded major transportation arteries that are used on a daily basis by 100,000 North Shore commuters, and caused disruption to utilities which serve the entire North Shore. The residential, commercial, industrial and commuter population affected by the flood was nearly 400,000.

In the past 17 years, a total of four major floods of 10 to 100 year frequency have occurred in the study area (1972, 1978, 1979 and 1987). Because of growth within the study area and increased costs associated with damages and losses, a recurring '78 storm tide would now cause damages estimated at over \$100 million (1989 tide levels). The Standard Project Northeaster (SPN) represents the worst combination of high moon tides and storm surge which is likely to occur. If an SPN occurred, it would damage close to 5,000 buildings. With one foot of sea level rise, the SPN event could cause damages in the range of \$500 million. Damages to homes and businesses from coastal storms also happen every year within the study area, although on a smaller scale. There is a relatively small hydrologic difference between coastal floods which are mere inconveniences and those which trigger very severe damages. A flood of 1 foot above a yearly high tide means wet basements in about 400 buildings; a flood of 2 feet above a yearly high tide requires the emergency evacuation of thousands of people from thousands of buildings. Forecasted accelerated rates in sea level rise, with estimated increases ranging from 1.6 to 4.2 feet over the next century, indicates a growing potential for repeated catastrophic flooding in the study area.

COASTAL STORM DAMAGES IN LYNN

The portion of the study area in Lynn, the SPN flood plain (at 1989 tide levels), includes a total of about 1,200 buildings, half of which are commercial and industrial. One section, the Lynn Harbor shorefront, includes some residences as well as the commercial and industrial district along Route 1-A, known as the Lynnway. This highway serves about 30,500 vehicles transporting North Shore commuters each day and is also a direct access route for many of Lynn's businesses and industries. The floodplain also houses major North Shore utilities including electric and gas distribution centers and a Regional Wastewater Treatment facility which serve North Shore communities that lie outside the study area. Also notable are the new North Shore Community College, West Lynn Creamery, Phillips Lighting, Norelco, MBTA facilities, many new and used car dealers, service stations, the Boston & Maine Commuter Rail and the Salem Turnpike (Route 107).

In the Blizzard of '78, tides overtopped the entire Lynn Harbor and Saugus River shorefront, flooding businesses with water depths of up to four feet. Recurring 1978 flooding could cause damages approaching \$65 million, while damages from a disastrous SPN storm plus one foot of sea level rise would be \$378 million. In 1987, flood waters again overtopped the Lynn Harbor and Saugus River area, causing erosion behind bulkheads and flooding commercial properties to depths of several feet. Even during years without major storms, high tides frequently cause saltwater to pond around parking areas, on streets, and unloading zones, leading to damages and delays in commercial activities and transportation.

Also located in Lynn, the General Electric River Works complex includes about 265 buildings and a work force of 8,000-10,000 with a payroll worth \$300-400 million a year. In 1978 the complex was shut down at the start of the Blizzard in advance of high tides, preventing considerable damage. Floodwaters of 1 to 2 feet were reported in the complex, with much greater

depths in parking areas which are flooded frequently. Flooding to SPN levels at 1989 tide levels could reach depths of 4 feet around the complex, or higher with sea level rise. With such an event, operations normally carried out at the plant may need to be transferred on an emergency basis to another GE plant in Ohio, thereby threatening the steam turbine generator and jet engine production and other military and civilian contracts worth \$2-4 billion which this plant completes each year.

COASTAL STORM DAMAGES IN SAUGUS

The portion of the study area within Saugus includes the community of East Saugus, an area with 600 homes and businesses located between the Saugus and Pines River marshes. During the Blizzard of '78 saltwater was up to 5 feet deep in this area, and hundreds of people had to be evacuated to emergency shelters. The area also includes Route 107, the Boston and Maine Commuter Rail, most of the town's commercial navigation fleet and related facilities, elderly housing, a school, the Eastern Tool Company, RESCO Energy Systems, several marinas, and about 40 other businesses. A recurring '78 tide would cause \$15 million in damages, and a maximum of \$38 million, with flooding depths exceeding 8 feet, with an SPN event with one foot of sea level rise. The area was also flooded during coastal storms in 1972, 1979 and January 1987.

Frequent flooding of properties is also a problem. Twice in December 1986 residents contacted the U.S. Army Corps of Engineers because of high tides which were flooding basements in homes that border the Pines River marsh.

There are about 300 buildings that are located in the floodplain of the Upper Saugus River and Shute Brook areas. Flooding up to 5 foot flood depths was reported during the '78 Blizzard. Town officials reported that high tides cause drains to back up, flooding buildings in the center of town on higher ground. Shute Brook, especially, backs up, flooding homes with a combination of high tides and runoff such as occurred in 1979.

COASTAL STORM DAMAGES IN REVERE

Approximately one third of the city of Revere (2,650 buildings) is within the study area, including the Revere Beach Backshore where 1,200 homes and businesses are located behind Revere Beach and along the banks of the Pines River. In the Blizzard of '78, a reported 3,000 people were evacuated to the Revere High School, as flood waters reached depths of 7 feet around homes and businesses. Saltwater flowed into the area from several directions from overtopping of the seawall and banks of the Pines River. The area also includes the MDC's Revere Beach Reservation and facilities, the Wonderland Dog Track and Park, the Towle Industry Building and Revere High School, many high rise condominiums and retail office buildings. The MBTA Blue Line, Boston & Maine Commuter Rail, Route 107, North Shore Road (1A), numerous marinas and over 100 businesses also lie in this area. Future 1978 tide

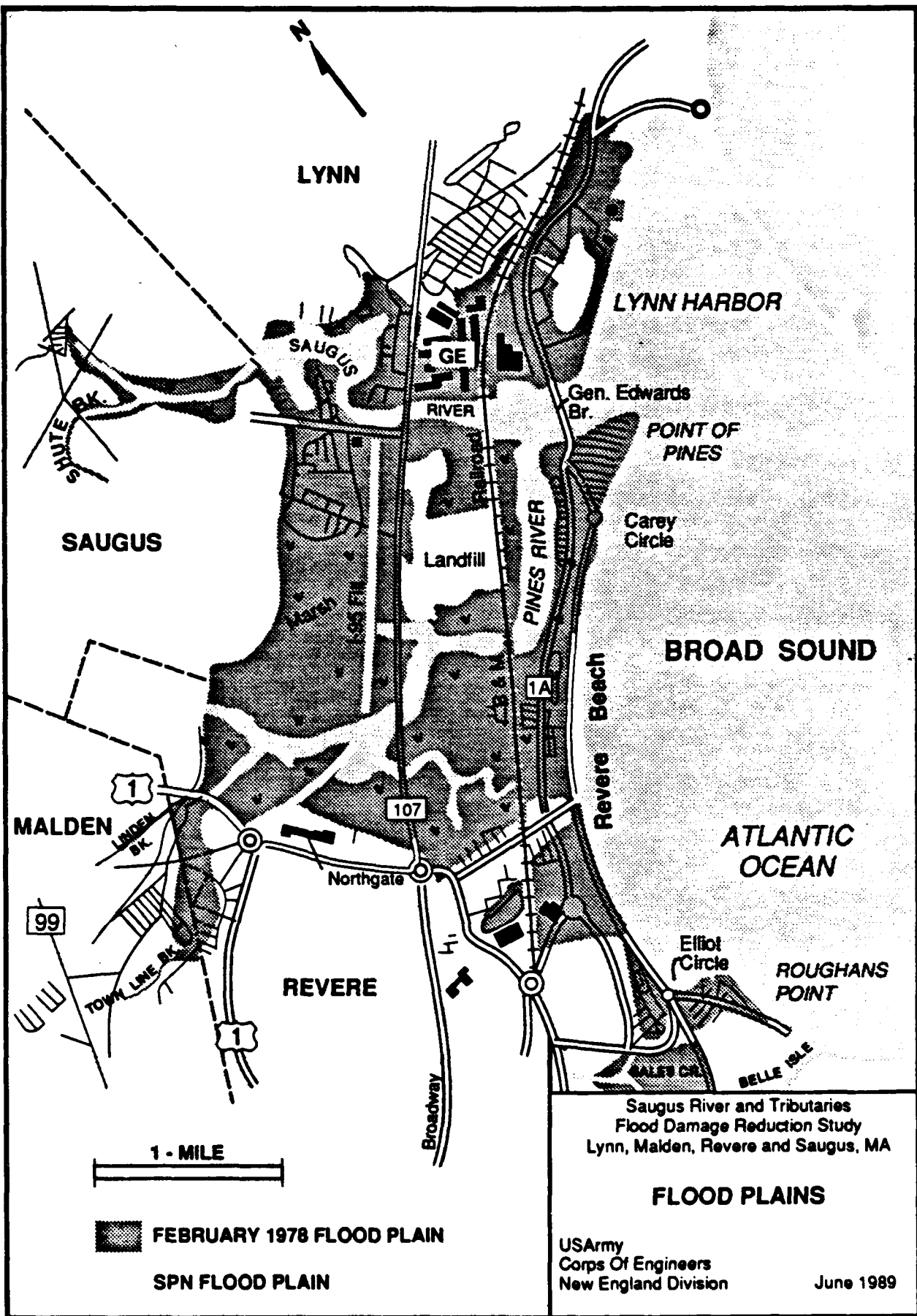
levels would cause damages of \$33 million. The SPN, with depths up to 9 feet, would cause damages of \$80 million with sea level rise.

At Point of Pines, which is located just north of Revere Beach along the Saugus River, about 370 homes were flooded with depths to 4 feet during the '78 Blizzard and two houses burned when fire equipment was unable to reach them. The area is one of the most vulnerable to coastal storms and was extremely hard hit by the Blizzard of '78. Severe overtopping also occurred in 1972 and 1979, and in 1987 the ocean flowed in freely by the Yacht Club along the Saugus River. In 1978, residents remained stranded overnight with no heat, electricity or means of evacuation.

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The Town Line Brook area (including Linden Brook) lies in both Revere and Malden. The estimated SPN (1989 tide levels) floodplain includes about 210 buildings in Malden and another 800 in Revere which are subject to flooding directly from the Pines River and from the backup of drainage in the brooks during high tides. Flooding occurred in this area during the Blizzard of '78, and in 1979 with flood levels reaching Elevation 7 to 8 feet NGVD on both occasions, with 3 to 4 foot depths of water. In 1987 waters reached the top of the banks of Town Line Brook. Most of the flood problems in this area will be addressed by the MDC Town Line Brook flood control project.



JUL 24 1989

Army Corps of Engineers seeks input on flood-control proposals

WALTHAM — Coastal flood damage reduction in the Saugus and Pines rivers and Broad Sound areas of Lynn, Malden, Revere and Saugus will be the topic of a public workshop to be held at 7 p.m. in Revere High School on July 27.

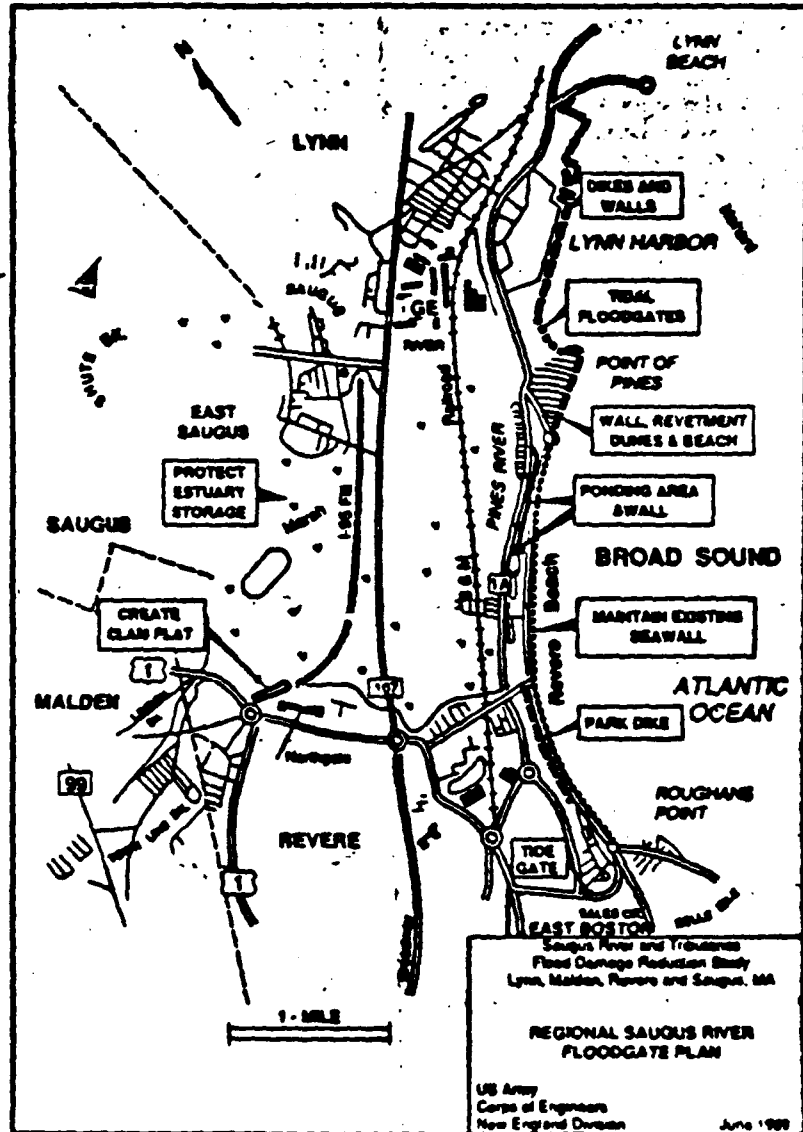
The session will focus on a regional floodgate plan proposed by the U.S. Army Corps of Engineers. The three and one-half year-long investigation is sponsored by the four communities and the Metropolitan District Commission.

"The public workshop will afford all interests an opportunity to gain a better understanding of the recommended plan," according to Col. Daniel M. Wilson, head of the engineers in New England.

The engineers have recommended construction of tidal floodgates at the mouth of the Saugus River to prevent tidal surges from entering the river and flooding land throughout the four-community project area. The floodgate structure would span 1,275 feet at the mouth of the river and would include 600 feet of gated openings to assure safe navigation passage and natural flushing in the estuary.

The plan also includes a combination of dikes, walls, stone revetments, beaches and sand dunes along the Lynn shorefront and at Point of Pines in Revere. A raised embankment behind part of Revere Beach would also be included as a flood control dike and park area for public recreation.

The \$78.9 million proposal would reduce flood damages to 5,000 buildings and major utilities serving the north shore. It would also minimize disruption of public transportation and provide a safer port of refuge for the 400 vessel fleet using the waterway.



The estuary's natural flood water storage area receives protection under the plan.

The federal government would finance 65 percent or \$51.3 million of the project cost. Non-federal interests would be required to pro-

vide the remaining 35 percent of \$27.6 million.

The construction period is scheduled to start in 1994. A draft study report and environmental impact statement on the project are under public review until Aug. 7.



CITY OF LYNN
PLANNING BOARD
CITY HALL ROOM 106
LYNN, MASSACHUSETTS
01901

TEL 598-4000

EAT 162

August 01, 1989

Robert G. Hunt
Project Manager
Department of the Army
New England Division,
Corps of Engineers
424 Trapelo Road
Waltham, Ma. 02254

Dear Sir,

Enclosed please find the comments received from the D.E.P. Division of Wetlands and Waterways on the planning perspective, South Harbor Lynn, November 1988. Comments #3 and #6 may bear a direct relationship to the local protection plan proposed across this area.

Sincerely

Stephen L. Smith
Assistant Planning Director



Daniel S. Greenbaum
Commissioner

Gary R. Clayton
Director

The Commonwealth of Massachusetts

Executive Office of Environmental Affairs

Department of Environmental Quality Engineering

Division of Wetlands and Waterways Regulation

One Winter Street, Boston, Mass. 02108

December 29, 1988

Mr. Edward D. Hollingshead
Principal Planner
Fay, Spofford & Thorndike, Inc.
20 Park Plaza
Boston, MA 02116

RE: Planning Perspective, South Harbor, Lynn

Dear Mr. Hollingshead:

Thank you for providing the Division of Wetlands and Waterways Regulation with an opportunity to review the "Planning Perspective Preliminary to Draft Environmental Impact Report" for South Harbor in Lynn. Due to the Chapter 91 licensing requirements for any development in this area, the Department takes a strong interest in your planning activities.

We offer the following comments for your consideration as you prepare your Draft Environmental Impact Report:

1. The non-water dependent hotel, office, and condominium uses proposed here are inconsistent with the maritime industrial goals of the Designated Port Area. De-designation of this area will have to take place before DEQE can license the proposed uses. This process will be a joint one between this Office and Coastal Zone Management.
2. The effects of buildings of this height (up to 200') on the waterfront will be substantial. The visual, wind, and shadow impacts of such buildings will have to be carefully analyzed in light of potential detriments to the public's rights in these tidelands. Lower building heights should be considered.
3. The 70' setback is inadequate given the size of the proposed buildings. Building the rip-rap out into the watershed to obtain public access (Figure 10, Option 3) is unacceptable to DEQE. Considering rip-rap as part of the setback (Option 2) is also unacceptable as this is not publicly usable space. Therefore, the only way to obtain adequate setback is to place the buildings further than 70' from the water's edge.

4. Much more specific information is needed regarding the Chapter 91 benefits as described on pp. 5-6:

-What type of improvements are proposed on MDC property?

-What is the nature of proposed public use space within the buildings?

-What specifically about the design and programming elements will make the public space "a high quality waterfront amenity?"

5. On the northern tip of the site, an appropriate marine industrial use is proposed as one of four possible options (p. 35). We strongly urge that such a use be included as part of the proposal since, given the size of this project, little is proposed in the way of direct water-related benefits. In fact, the whole issue of water-related benefits must be carefully examined. Could you provide benefits to local commercial fishermen? Is water transportation an option here? Could recreational boating opportunities be developed? Much more in the way of water-related benefits must be analyzed and incorporated into the design of this waterfront site.

6. What is the elevation of the proposed walkway and will it be subject to flooding?

We appreciate the early opportunity to provide you with some preliminary comments on this project and look forward to continued involvement as you progress through the environmental review process.

Sincerely,



Gary Clayton
Division Director

GC/DH/dh

cc: Richard Delaney, CZM
Dennis Ducsik, CZM
Julia O'Brien, MDC
Kevin Geaney, Director, Lynn Planning Department

The City of Revere Massachusetts



City Council

4 PUTNAM ROAD
REVERE, MA 02151
289-6444 286-2321

JOHN ARRIGO
COUNCILLOR

August 3, 1989

Frank Stringi, Director
Planning & Community Development
Revere City Hall
Revere, MA. 02151

Dear Frank:

At a recent meeting of Point of Pines residents concerning the Regional Floodgate Project, held on August 1st, a request was made that a resident living along Rice Avenue, not affiliated with any organization be added to the Steering Committee.

Mr. Robert Hunt, Project Manager from the Army Corps of Engineers, could see no problems with this request but suggested that it should go through your office.

Mr. Thomas Kavanaugh volunteered his services as a representative. There were no objections from any residents. As a matter of fact, from a vote taken, the residents in attendance at the meeting were in favor of Mr. Kavanaugh representing their interests.

I also think it would be beneficial to the project, so as the City Councillor representing the area of the Point of Pines, I would like to offer my support for Mr. Kavanaugh. He has shown genuine interest and has been in attendance of all meetings.

Your approval would be very much appreciated.

Sincerely,

John R. Arrigo
Revere City Council

cc: Robert Hunt, Army Corps

AUG 9 1989

Planning Division
Basin Management Branch

Mr. Thomas P. Kavanagh
75 Rice Avenue
Revere, MA 02151

Dear Mr. Kavanagh:

I appreciate your interest to participate on the Citizens' Steering Committee for the Saugus River and Tributaries Flood Damage Reduction Study as recommended by Mr. John Arrigo, your city councillor.

Your active participation during meetings at Point of Pines to present the concerns of the affected shorefront property owners has been a significant help to us. The overwhelming support of residents at the August 1 meeting in Point of Pines showed their confidence as well, in you representing their views on the Steering Committee.

My staff and I are looking forward to working with you on the Committee over the next several years for this important Regional Project.

If you have any questions, please feel free to call me at (617) 647-8508 or Mr. Robert G. Hunt, the Project Manager, who can be reached at (617) 647-8216.

Sincerely,

Joseph L. Ignazio
Chief, Planning Division

Copies Furnished:

Mr. Frank Stringi, Director
Planning and Community Development
City Hall
Revere, MA 02151

Mr. John Arrigo
City Councillor
Revere City Hall
Revere, MA 02151



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
199-169
Planning Division
Basin Management Branch

August 14, 1989

Commissioner Ilyas Bhatti
Metropolitan District Commission
20 Somerset Street
Boston, Massachusetts 02108

Dear Commissioner Bhatti:

I appreciate the assistance of your staff in coordinating the Saugus River and Tributaries Flood Damage Reduction Study for Lynn, Malden, Revere and Saugus, Massachusetts. During the public review of the draft report ending August 7, 1989, letters supporting the Regional Saugus River Floodgate Plan have been received from the communities and provided to your staff. At this time, a Letter of Intent is required from the MDC before we can submit the project report to Washington in October.

A concern of the Regional Floodgate Plan is the capability of the MDC for operation and maintenance (O&M) of the floodgate component of the project. Former Commissioner Geary had requested that the Corps take responsibility for operating and maintaining the proposed floodgate component of the project, although the MDC would finance O&M which would require state legislative approval. Prior to his departure, I advised him that the Water Resources Development Act of 1986 established that the non-Federal sponsor was responsible for the project's operation and maintenance. Also the Corps did not have the personnel to assign to the project. On July 13, 1989, my staff met with Messrs. Noel Baratta, Francis Faucher and others from your staff to discuss the O&M requirements and confirm that the Corps could not O&M the floodgate structure. As a result, discussion led to those disciplines and levels of effort that would be required by the MDC for O&M of the project. Also my staff offered to train and assist the MDC in regulating the gates over a three year period and as needed thereafter. This is in addition to the semi-annual inspections of the project by the Corps with MDC staff and preparation of the Regulation Procedures and Operation and Maintenance Manual which would be prepared during construction of the project.

On August 3, our staffs met to develop a revised feasibility level cost estimate for the proposed operation and maintenance by non-Federal interests. This cost estimate is a significant revision to the estimate currently shown in the public review draft still in the review and comment stage. The initial estimate assumed two full-time operators would be required and includes conservatively high estimates for gate maintenance. A summary of the estimate revised during the meeting is attached which includes MDC labor rates and average costs based on past experience to maintain the gates, provide security and inspections for the floodgates, estuary and other features, coordinate the project and operate the gates. As shown, the revised total average annual O&M cost could be as low as \$127,000 per year

which includes \$80,000 for the floodgates, \$26,000 for other features and \$21,000 for contingency.

The total \$127,000 per year average O&M cost is based on 1988 price levels and does not reflect inflation. This is the minimum O&M cost and could increase due to any major unforeseen damages and breakdowns which may not be covered by the contingency. The floodgate component's total average annual O&M cost of \$80,000 includes about \$49,000 for labor, \$21,000 for major maintenance contracts and \$10,000 for supplies and equipment. The floodgate annual labor includes a project manager or engineer at 3.5 man-months, operation and maintenance personnel at 7.6 man-months and security officers for 2.3 man-months. As previously suggested by Commissioner Geary, the General Edwards Bridge operator may be used in both capacities. Although one operator/maintenance person should be assigned to the floodgates as his primary responsibility.

The annual \$26,000 O&M figure for other features includes the park dike at the MDC reservation and features at Point of Pines and Lynn Harbor. It includes about \$18,000 of similar effort currently being spent to maintain the existing shorefront. The increased cost is about \$8,000 per year. During design you may decide to review the costs with the communities of Revere and Lynn to determine whether they or their property owners would finance all or part of the O&M along their shorefront, just as the neighborhood of Point of Pines strongly prefers to continue maintaining their shorefronts.

The public requested and your staff indicated that it may be necessary to establish an escrow account to fund the O&M effort. This approach could be explored further and an acceptable solution reached during the design period. The present worth of the total O&M project cost (including 3 percent annual inflation, as requested by your staff, and 8 7/8% interest over 100 years, with contingency) is \$4^{2.8}~~4.6~~ million. The floodgate component only, with contingency, would be \$3^{2.8}~~3.6~~ million at present worth.

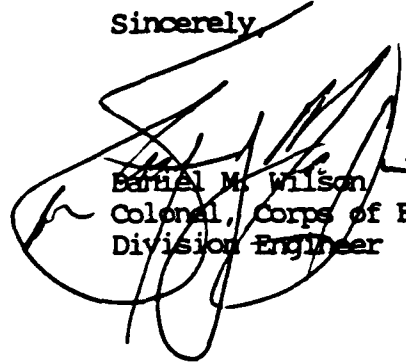
The Letter of Intent needed from the MDC by mid-September was discussed at the July 13, 1989 meeting as well as a draft Local Cooperation Agreement. The letter should indicate that you intend to pursue funding from the state legislature at the appropriate time (earliest 1994), and at that time intend to sign the final Local Cooperation Agreement and agree to project cost sharing. The final estimate of project costs and cost sharing arrangements would be available at that time.

The total project first cost is estimated at \$78.9 million (1988 price level). The Federal Government would finance 65 percent or \$51,300,000 of the project first cost. The non-Federal cost of the project is 35 percent or currently estimated at \$27,600,000 (includes \$3,644,000 in Real Estate and \$695,000 in relocation or alterations to existing utilities). As the state sponsor, MDC would be required to provide cash contributions estimated at \$23,261,000 during construction which is currently scheduled to start in fiscal year 1994, in addition to meeting the real estate and relocation requirements. Following completion of the project, an estimated \$127,000 per year operation and maintenance cost would be a continuing non-Federal responsibility.

The \$78.9 million project first cost is a conservative estimate and includes \$15 million in contingencies for unknown costs during design and construction. Also, nearly \$5 million of revetments at Point of Pines may be replaced with a dune/beach system. Walls and dikes along Lynn Harbor, if constructed by developers, would reduce project costs. We will work closely with you and the communities over the next few years to realize all potential cost savings.

If you or your staff have any questions, please call me at (617) 647-8220, or Mr. Robert Hunt, the study manager, at 647-8216.

Sincerely,



Barthel M. Wilson LTC, CE
Colonel, Corps of Engineers
Division Engineer

Enclosure

Copy Furnished:

Ms. Rebecca Calahan
Regional Coordinator
Governor's Office of
Economic Development
Room 109, State House
Boston, MA 02133

SAUGUS RIVER AND TRIBUTARIES REGIONAL FLOODGATE PLAN

OPERATION AND MAINTENANCE COST SUMMARY* (1988 Price Levels, over a 100 year Project Life)

1. Floodgates	Average Annual O&M Cost
a. Major Contracts	
•Painting and Repairs:	
Navigation Gate (\$140k @ 10yrs)	\$ 9,300
Flushing Gates (\$260k @ 20yrs)	5,200
•Pave Parking Area:	
(\$26k @ 15 yrs)	1,000
•Training by Corps	
(3 yrs @ 20k/yr and ass't as needed)	<u>5,500</u>
Total Contracts:	\$ 21,000
b. Labor (MDC Rates including Overhead)	
•Project Manager and Engineers	
(Admin., Inspec., Operations, Coord.)	
3.5 man-mo. avg. per yr. @ \$5,500/mo.	\$ 19,300
•Gen. Maintenance, Operations & Coord.	
(Maint., Inspec., Oper., Contracts)	
7.6 man-mo. avg. per yr. @ \$2,900/mo.	22,000
•Security Officer	
(Security of Floodgate Structure)	
2.3 man-mo. avg. per yr. @ \$3,200/mo.	<u>7,400</u>
Total Labor:	\$ 48,700
c. Materials, Supplies and Equipment	
•Monitoring Equipment, Vehicles, Tools, etc.	<u>\$ 10,000</u>
Total Floodgates:	\$ 79,700
2. Park Dike	
(about \$6,300 is currently being spent to maintain the existing parkland)	7,900
3. Revere Tide Gate & Ponding Area	
(about \$500 is currently being spent to cleanup the ponding area)	1,400
4. Point of Pines	
(about \$5,700 is currently being spent to maintain existing walls, dunes and revetments)	7,200
5. Lynn Harbor	
(about \$5,100 is currently being spent to maintain walls and dikes)	8,300
(Total maintenance cost currently being spent for items #2 - #5 is about \$17,600 per year)	
6. Mitigation Site	
	<u>1,000</u>
Total Other Features #2 - #6	\$ 25,800
Sub-Total O&M	\$105,500
Contingency (20%)	<u>21,100</u>
Total project O&M per year	\$126,600
SAY	<u>\$127,000</u>

Present Worth of O&M with 3% annual inflation @ 8 7/8% interest over 100 years (factor 36.4):

Total O&M (present worth): ~~\$4.6~~^{2.9} million
Floodgate only w/contingency: ~~\$3.5~~^{2.0} million
1.6



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
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October 30, 1989

REPLY TO
ATTENTION OF
Planning Division
Basin Management Branch

Mr. Douglas G. Marshall
Executive Director
New England Fisheries Management Council
5 Broadway Street
Saugus, Massachusetts 01906

Dear Mr. Marshall:

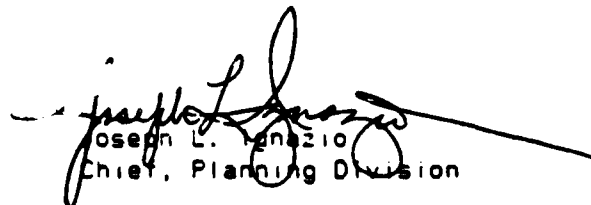
We are forwarding the enclosed documents in response to your September 25, 1989 letter requesting information under the Magnuson Fishery Conservation and Management Act, section 1852 (i), 16 USC section 1801 et. seq. The documents include a Draft Environmental Impact Statement and Environmental Impact Report for the Saugus River and Tributaries Flood Damage Reduction Study, as well as the Main Report and pertinent Appendices.

We are currently evaluating the project features in response to public and agency review. A detailed answer to all of your comments will be provided upon finalization of the proposed project changes. It would be inappropriate to address your concerns now and then have to provide you with an amendment within a few months. We hope to be able to provide direct answers to you this winter.

Should you have further questions, please contact Mr. Robert Hunt, the project manager (617-647-8216) or Mr. William A. Hubbard, the EIS manager (647-8236) of my staff.

Sincerely,

Enclosures


Joseph L. Ignazio
Chief, Planning Division

ATTACHMENT H
DISTRIBUTION LIST FOR
DRAFT AND FINAL FEASIBILITY REPORT
AND EIS/EIR

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25 Jun 88
BMB (87-22) pg. 1 of 3
and Technical Group et al

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President

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